



MADAME CURIE

JEVIE CURIE

OXFORD UNIVERSITY PRESS



Blanche de Lorier

MARIE CURIE
A Portrait Made in 1929

66

MADAME CURIE

BY

EVE CURIE

TRANSLATED BY VINCENT SHEEAN

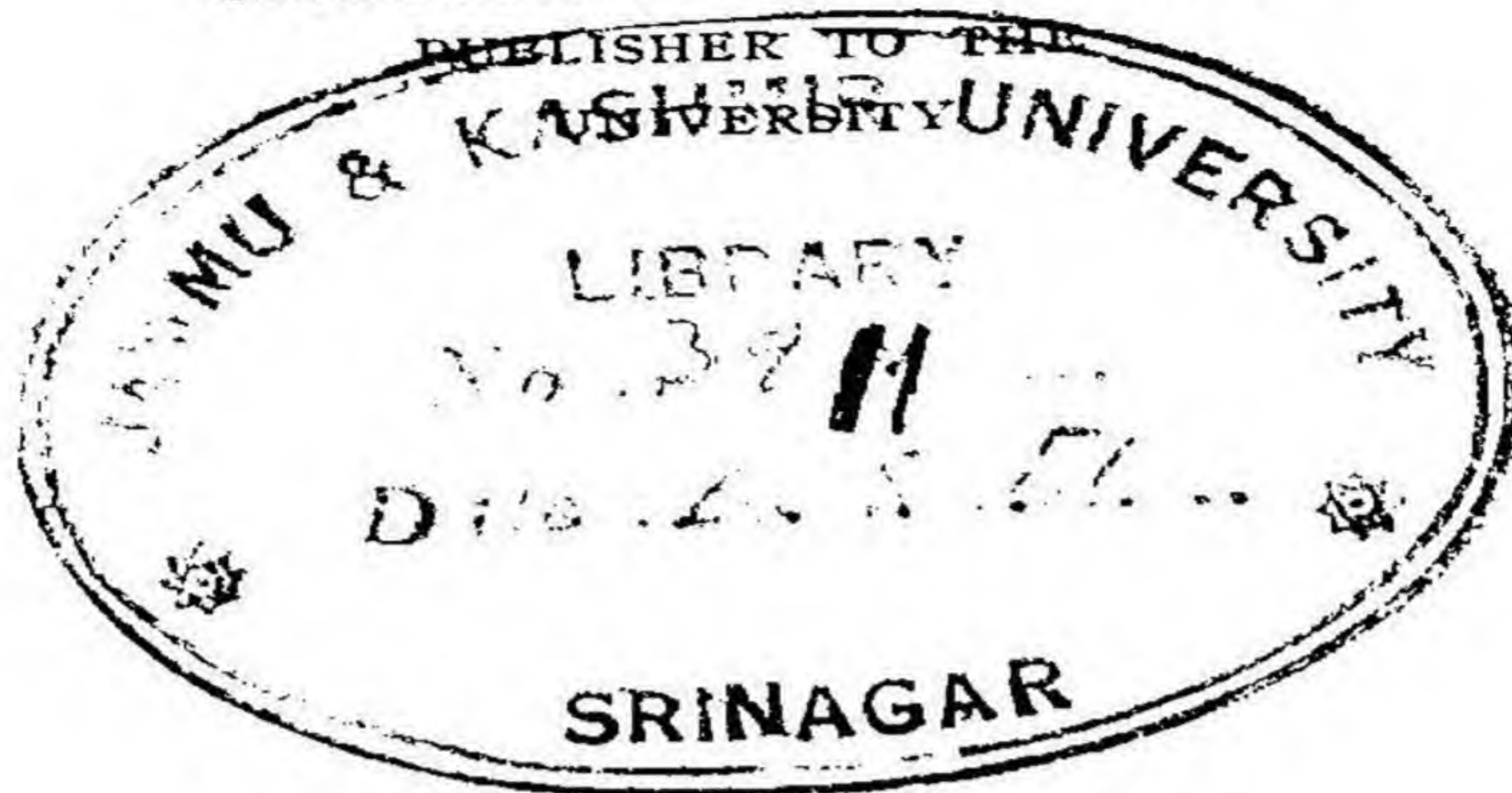
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Marie Curie, a portrait made in 1929 *Frontis*

They began to build a scaffolding of chairs ..

The girl was already studying tomorrow's lesson ...

Radium was spontaneously luminous

The drawings are by Jacques Brown

INTRODUCTION

THE life of Marie Curie contains prodigies in such number that one would like to tell her story like a legend.

She was a woman ; she belonged to an oppressed nation ; she was poor ; she was beautiful. A powerful vocation summoned her from her motherland, Poland, to study in Paris, where she lived through years of poverty and solitude. There she met a man whose genius was akin to hers. She married him ; their happiness was unique. By the most desperate effort they discovered a magic element, radium. This discovery not only gave birth to a new science and a new philosophy : it provided mankind with the means of treating a dreadful disease.

At the moment when the fame of the two scientists and benefactors was spreading through the world, grief overtook Marie : her husband, her wonderful companion, was taken from her by death in an instant. But in spite of distress and physical illness, she continued alone the work that had been begun with him and brilliantly developed the science they had created together.

The rest of her life resolves itself into a kind of perpetual giving. To the war wounded she gave her devotion and her health. Later on she gave her advice, her wisdom and all the hours of her time to her pupils, to future scientists who came to her from all parts of the world.

When her mission was accomplished she died exhausted, having refused wealth and endured her honours with indifference.

It would have been a crime to add the slightest ornament to this story, so like a myth. I have not related a single anecdote of which I am not sure. I have not deformed a single essential phrase or so much as invented the colour of a dress. The facts are as stated ; the quoted words were actually pronounced.

I hope that the reader may constantly feel, across the ephemeral movement of one existence, what in Marie Curie was even more rare than her work or her life : the immovable structure of a character ; the stubborn effort of an intelligence ; the free immolation of a being that could give all and take nothing, could even receive nothing ; and above all the quality of a soul in which neither fame nor adversity could change the exceptional purity.

Because she had that soul, without the slightest sacrifice Marie Curie rejected money, comfort and the thousand advantages that genuinely great men may obtain from immense fame. She suffered from the part the world wished her to play ; her nature was so susceptible and exacting that among all the attitudes suggested by fame, she could choose none : neither familiarity nor mechanical friendliness, deliberate austerity nor showy modesty.

She did not know how to be famous.

I should have liked the gifts of a writer to tell of this eternal student —of whom Einstein said : ‘ Marie Curie is, of all celebrated beings, the only one whom fame has not corrupted ’ —passing like a stranger across her own life, intact, natural and very nearly unaware of her astonishing destiny.

EVE CURIE

CHAPTER I

MANYA

DEEP silence invaded the school building in Novolipki Street on Sundays. Beneath the stone pediment, carved in Russian letters with the words 'High School for Boys', the principal door was bolted and the columned vestibule looked like an abandoned temple.

But something had disturbed this peace. From the left wing of the building, on the ground floor, where dwelt M. Vladislav Sklodovski,¹ professor of physics and under-inspector of the school, there came the muffled echo of mysterious activity.

The Sklodovski children were playing their game of war with shrieks and yells. On one side there was Joseph and his ally Hela and on the other side was Bronya; at her side, a tiny lieutenant in a fancy apron gathered up munitions, galloped from one battalion to another, and busied herself mightily, her face aflame, her lips dry from having cried and laughed too much.

'Manya!' ²

The child stopped in full flight and allowed her apron which she held clutched to her breast, to fall; a consignment of blocks clattered to the floor.

'What's the matter?' ³

Zosia,³ the eldest of the young Sklodovskis, had just come into the room. Although she was not yet twelve she appeared, beside her younger brother and sisters, to be a grown person. Her long, ash-blond hair was thrown back to fall loosely on her shoulders. She had a lovely, animated face and dreaming eyes of exquisite grey.

'Mother says you've been playing too long. You must stop now.'

'But Bronya needs me . . . I'm the one that brings her blocks!'

'Mamma says you're to come now.'

After a moment's hesitation Manya took her sister's hand and made a dignified exit. It is hard to fight a war at the age of five, and the little girl, at the end of her strength, was not altogether unhappy to abandon the battle. From the next room a gentle voice was calling her by names like caresses: 'Manya . . . Manyusya . . . my Anciupecio⁴ . . .'

In Poland, diminutives and nicknames are very common. The Sklodovskis had never called Sophie, their eldest daughter, anything but 'Zosia'. 'Bronya' had taken the place of Bronislava,⁵ Helen became 'Hela', and Joseph 'Jozio'. But none of them had received as many nicknames as Marya, the youngest and best-loved in the house. 'Manya' was her ordinary diminutive, 'Manyusya' a name of affection, and 'Anciupecio' a comic nickname dating from her earliest infancy.

'Anciupecio, how untidy your hair is! And how red you are!'

Delicate hands, too pale and too thin, tied the undone ribbons of the apron and smoothed the short curls from the stubborn face of the future scientist. Little by little, the child relaxed and was at peace.

Manya had an infinite love for her mother. It seemed to her that no other creature on earth could be so graceful, so good or so wise.

'Now then, Anciupecio, are you asleep?'

Manya, doubled up on a little hassock at her mother's feet shook her head.

'No, Mamma. I'm all right.'

Once again Mme Sklodovska ran her light fingers over the forehead of her youngest child. That familiar gesture was the sweetest Manya knew. As far back as Manya could remember she had never been kissed by her mother.

She could imagine no greater happiness than to crouch near by, as close as possible to the pensive and charming figure, and to feel confusedly, by almost imperceptible signs—a word, a smile, an affectionate look—what immense tenderness watched over her young destiny.

She did not yet understand the cruel origin of these rites and of the isolation to which her mother was condemned: Mme Sklodovska was seriously ill. The first signs of tuberculosis had appeared when Manya was born, and in the five years since then, in spite of care and consultation, the disease had made certain progress.

The young woman rose and gently put aside the childish hands that clung to her.

‘Let me go, Manyusya . . . I have things to do.’

‘May I stay here—I—may I read?’

‘I wish you would go into the garden instead. It’s so beautiful today!’

A very special timidity reddened Manya’s cheeks when she broached the subject of reading: the year before, in the country, Bronya, finding it extremely boring to have to learn the whole alphabet by herself, had taken it into her head to make her sister an experiment in education, to ‘play teacher’ to her. For several weeks the little girls had amused themselves by arranging, in what was often enough an arbitrary order, their letters cut out of cardboard. Then, one morning, while Bronya was faltering out a very simple reading lesson to her parents, Manya grew impatient, took the opened book from her hands, and read aloud the opening sentence on the page. At first flattered by the silence that surrounded her, she continued this fascinating game, but suddenly panic seized her. One look at the stupefied faces of M. and Mme Sklodovski, another at Bronya’s sulky stare, a few unintelligible stammers, an irrepressible sob—and instead of the infant prodigy there was only a baby of four, crying in a doleful voice through her tears.

‘ Beg—pardon ! Pardon ! I didn’t do it on purpose. It’s not my fault—it’s not Bronya’s fault ! It’s only because it was so easy ! ’

Manya had suddenly conceived, with despair, that she might perhaps never be forgiven for having learned to read.

Manya cast a speculative eye in the direction of the door through which she had entered a while before. The rumble of blocks on the floor and the cries that came almost unmuffled through the partition, proved that she had small chance of finding a walking companion there. There was no hope in the direction of the kitchen, either : a steady chatter and the crash of poker and stove-lid announced that the servants were preparing the evening meal.

‘ I’ll look for Zosia.’

‘ If you like.’

‘ Zosia . . . Zosia ! ’

Hand in hand the two sisters went, through the narrow yard where, every day, they had played hide-and-seek and blind-man’s-buff. Passing the school buildings they reached a big level garden guarded by its gate of worm-eaten wood.

A faint smell of the earth, of countryside, was exhaled by the meagre grass and walled-in trees.

‘ Let’s run. I’ll bet I can get to the end of the garden before you ! ’ Zosia cried, taking her role as ‘ mother ’ with becoming seriousness.

‘ I don’t want to run. I want you to tell me a story.’

Nobody—not even the professor or his wife—could tell a story like Zosia. Her imagination added extraordinary touches to every anecdote or fairy-tale. She also composed short comedies, which she performed with spirit in front of her astonished sisters and brother.

The girls turned back toward the house. As they drew nearer to the high school the elder instinctively slowed

down and lowered her voice. The story she was making up and declaiming was not finished : even so, Zosia cut it short. The children walked silently past the windows in the right wing of the school all veiled by the same stiff lace curtains.

Behind those windows lived the person whom the Sklodovski family most feared and detested : M. Ivanov,⁶ director of the Gymnasium,⁷ the man who represented, within the walls of that school, the government of the Tsar.

It was a cruel fate, in the year 1872, to be a Pole, a 'Russian subject', and to belong to that vibrant intelligentsia⁸ whose nerves were so near the surface ; among them revolt was ever brooding, and they suffered more painfully than any other class in society from the servitude imposed upon them.

Exactly a century before, greedy sovereigns, the powerful neighbours of a greatly weakened State, had decided Poland's ruin. Three successive partitions had dismembered it into fragments which became officially German, Russian and Austrian. On several occasions the Poles rose against their oppressors : they succeeded only in strengthening the bonds that held them prisoners. After the failure of the heroic revolution of 1831 the patriots were imprisoned and deported in a body and their property was confiscated.

From then everything was done to enforce the obedience of a Poland that refused to die. While the convoys of chained rebels made their way toward the snows of Siberia,⁹ a flood of policemen, professors and minor functionaries was let loose over the countryside. Their mission ? To keep watch over the Poles, to wear down their religion, suppress suspicious books and newspapers, and abolish the use of the national language little by little—in a word, to kill the soul of a people.

But in the other camp resistance was quick to organize. Disastrous experience had proved to the Poles that their

had no chance of reconquering their liberty by force, at least for the moment. Their task was therefore, to wait—and to prevent their people from becoming cowardly or discouraged by the repression.

The battle, therefore, had changed ground. Its heroes were no longer warriors who died saying, 'What happiness to die for my country!' The new heroes were the intellectuals, the artists, priests, school-teachers—those upon whom the mind of the new generation depended. Their courage consisted in forcing themselves to be hypocrites, and in supporting any humiliation rather than lose the places in which the Tsar still tolerated them—and from which they could secretly influence Polish youth and guide their compatriots.

Thus beneath the apparent politeness a profound antagonism existed between conqueror and conquered throughout the Polish schools—between the harassed teachers and the spying principals, the Sklodovskis and the Ivanovs.

The Ivanov who reigned over the school in Nowolipki Street was particularly detestable. Without pity for the fate of his subordinates who had been forced to teach the children of their country *in the Russian language*, he would pass with them from honeyed compliments to the coarsest reproof. In his zeal, Ivanov, who was an ignorant man, would review the compositions of day pupils looking for the 'Polish-isms' which occasionally slipped out in the work of little boys. His relations with Professor Sklodovski had grown singularly cold after the day when the latter, in defence of one of his pupils, had calmly replied:

'M. Ivanov, if that child made a mistake, it was certainly only a slip. . . . It happens that you, too, write Russian incorrectly at times—and indeed fairly often. I am convinced that you do not do it deliberately, any more than the child does.'

MANYA

The professor was talking to his wife of this same Ivanov when Zosia and Manya, returning from their walk, slipped into their father's study.

But the talk of the grown-ups was too boring
'Ivanov . . . the police . . . the Tsar . . .
deportation . . . a plot . . . Siberia . . .
Every day since she had come into the world Manya had heard the same phrases to which she obscurely attached some sort of fearful significance.

Isolating herself in deep childish dreams, the infant turned away from her parents and the murmur of their affectionate conversation. With her nose in the air Manya wandered about the room and stopped to admire the objects which were especially dear to her.

One, hung on the wall, was a precision barometer mounted in oak, with its long gilt pointers glittering against the white dial; on certain days the professor regulated and cleaned it minutely in front of his attentive children.

The other was a glass case with several shelves laden with surprising and graceful instruments, glass tubes, small scales, specimens of minerals and even a gold-leaf electroscope. . . . Professor Sklodovski used to take these objects into his classroom, but since the government had reduced the hours devoted to science, the glass case was always shut.

Manya could not imagine what these fascinating trinkets were. One day, straining on the tips of her toes, she was contemplating them with bliss when her father simply told her their name: 'Phy-sics app-a-ra-tus.'

A funny name.

She did not forget it—she never forgot anything—and as she was in high spirits, she sang the words in tune.

CHAPTER II

DARK DAYS

‘MARYA SKLODOVSKA.’¹⁰

‘Present.’

‘Tell us about Stanislas Augustus.’

‘Stanislas Augustus Poniatovski’¹¹ was elected King of Poland in 1764. He was intelligent and very cultured, the friend of artists and writers. He understood the defects that were weakening the kingdom and tried to remedy the disorders of the State. Unfortunately, he was a man without courage . . .’

The schoolgirl who stood up in her place looked much the same as her comrades as she recited her lesson in a clear, assured voice.

Mlle Tupalska¹²—currently nicknamed ‘Tupsia’—was not only teacher of arithmetic and history, but also exercised the functions of study superintendent; in that capacity she had been obliged to act with vigour, sometimes, against the independent spirit and stubborn character of the little Sklodovska.

However, there was much affectionate kindness in the look she bent on Manya. How could she not be proud of this brilliant pupil, two years younger than her classmates, who seemed to find nothing difficult and was invariably first in history, French—in everything?

Silence reigned in the classroom—and even something a bit more than silence. These history lessons took place in an atmosphere of passionate fervour. The eyes of twenty-five motionless, exalted little patriots and the rough countenance of Tupsia reflected their earnest enthusiasm. And, speaking of a sovereign dead many years before, it was with singular fire that Manya stated in her chanting voice:

‘ Unfortunately he was a man without courage’

The unattractive schoolmistress and her too serious pupils, to whom she was actually teaching the history of Poland *in Polish*, had the mysterious look of accomplices in conspiracy.

And suddenly, like accomplices, they were all startled into silence : the faint clatter of an electric bell had been heard from the landing.

Two long rings, two short ones.

The signal set up an instant agitation, mute but violent. Tupsia, on the alert, hastily gathered up the books spread out on the chair ; swift hands had piled up the Polish books and papers from the desks and dumped them into the aprons of four lively schoolgirls who disappeared with their load through the little door that led to the dormitory of the boarders. A sound of chairs being moved, of desk-lids opened and stealthily closed.

. . . . The four schoolgirls, breathless, returned to their places. And the door to the vestibule opened slowly.

On the threshold, laced into his fine uniform—yellow pantaloons and a blue tunic with shiny buttons—appeared M. Hornberg, inspector of private boarding-schools in the city of Warsaw.

Without saying a word, the inspector looked at the pupils. And near him, apparently unmoved, the directress who accompanied him, Mlle Sikorska¹³, looked at them too—but with secret anxiety. The delay had been so short today. The porter had just had time to sound the agreed signal when Hornberg, going ahead of his guide, reached the landing and plunged into the classroom. Was everything in order ?

Everything was in order. Twenty-five little girls bent over their work, thimble on finger, making buttonholes in squares of stuff unravelled at the edges. Scissors and reels of thread lay about on the empty desks. And Tupsia, with purple face and veins which showed in her

forehead, held on the table in front of her a volume properly printed in orthodox¹⁴ letters.

'These children have two hours of sewing each week, Mr Inspector,' the directress said calmly.

Hornberg had advanced toward the teacher.

'You were reading aloud. What is the book, mademoiselle?'

'Krylov's *Fairy Tales*. We began them today.'

Tupsia had answered with perfect calm. Bit by bit her cheeks were regaining their natural colour.

As if absent-mindedly, Hornberg opened the lid of the nearest desk. Nothing. Not a paper, not a book.

After having carefully finished off the stitching and fastened their needles in the cloth, the girls interrupted their sewing. They sat motionless with crossed arms, all alike in their dark dresses and white collars; and the twenty-five childish faces, suddenly grown older, wore a forbidding expression which concealed fear, cunning and hatred.

M. Hornberg, accepting the chair offered him by Mlle Tupalska, seated himself heavily.

'Please call on one of these young people.'

In the third row Marya Sklodovska instinctively turned away her frightened little face. A prayer rose in her:

'Please God, make it somebody else. . . . Not me Not me.'

But she knew very well the choice would fall upon her. She knew that she was almost always chosen for the government inspector's questioning, since she was the most knowledgeable and since she spoke Russian perfectly.

At the sound of her name she straightened up. She felt very warm—no, she felt cold. A dreadful shame seized her by the throat.

'Your prayer,' snapped M. Hornberg, whose attitude showed his indifference and boredom.

Manya recited correctly, in a voice without colour or expression. One of the subtlest humiliations the Tsar had discovered was to make the Polish children say their prayers every day *in Russian*.

Again silence.

'Name the Tsars who have reigned over our Holy Russia since Catherine II.'

'Catherine II, Paul I, Alexander I, Nicholas I, Alexander II.'

The inspector was satisfied. This child had a good memory. And what a marvellous accent! She might have been born in St Petersburg.

'Tell me the names and titles of the members of the Imperial family.'

'Her Majesty the Empress, His Imperial Highness the Cesarevitch Alexander, His Imperial Highness the Grand Duke . . .'

At the end of the enumeration, which was long, Hornberg smiled faintly. This was excellent, he thought. The man could not see, or did not wish to see, Manya's suffering, her features hardened by the effort she made to hide her rebellion.

'What is the title of the Tsar in the scale of dignities?'

'*Vielichestvo*.'¹⁵

The inspector took pleasure in these hierarchic details, more important to his way of thinking than arithmetic or spelling. For his own simple pleasure he asked again:

'Who rules over us?'

To conceal the fire of their eyes, the directress and the superintendent stared hard at the registers they held before them. As the answer did not come quickly enough, Hornberg, annoyed, asked again in louder tones:

'Who rules over us?'

'His Majesty Alexander II, Tsar of All the Russias,' Manya articulated painfully. Her face had gone white.

The session was over. The functionary rose from his chair, and, after a brief nod, moved off to the next room, followed by Mlle Sikorska.

Then Tupsia raised her head.

'Come here, my little soul.'

Manya left her place and came up to the schoolmistress, who, without saying a word, kissed her on the forehead. And suddenly, in the classroom that was coming to life again, the Polish child, her nerves at an end, burst into tears.

Meanwhile M. Sklodovski had had his salary reduced and his lodging taken away from him along with his title of under-inspector. It was official disgrace. Principal Ivanov was avenging himself on a subordinate who was not servile enough. So the Sklodovskis had to move and because they had become poorer the professor took two or three boarders at first—then five, eight, ten. He gave lodging, food and private instruction to these young boys, chosen from among his pupils. The house was transformed into a noisy barracks and intimacy vanished from the family life.

It was in January 1876, that Manya made sudden brutal acquaintance with unhappiness. One of the boarders had contaminated Bronya and Zosia with typhus. What horrible weeks!

One Wednesday the professor came to take Joseph, Hela and Manya to their eldest sister for the last time. Zosia, dressed in white, was stretched out on the bier, her face bloodless and as if smiling, her hands folded, marvellously beautiful in spite of her close-cropped head.

Soon after, in 1878, when Manya was ten years old, her mother died and M. Sklodovski was left alone to care for his four children.

Five o'clock. After tea the servants cleared the long table in the dining-room and lighted the lamp. The hour of work had come. The board pupils grouped themselves

by twos and threes in the rooms where they lived. The son and daughters of the professor remained in the dining-room, transformed into a study, and opened their books. After a few minutes there arose, from everywhere and nowhere, the chant which was for years a familiar sound in that house.

It was always the same children who could not keep from drawling aloud their Latin verses, their history dates or the statements of their problems. In every corner somebody was grumbling, somebody was struggling hard. How difficult everything was! Many a time the professor was obliged to calm the despair of some hopeful scholar who understood a lesson perfectly when it was made in his own language, but who, in spite of every effort, was incapable of understanding it in Russian, the official language—and even more incapable of repeating it.

Little Manya knew none of this anguish. Her memory was such that her comrades, hearing her faultless recitation of a poem they had seen her read no more than twice, thought at once of a trick, and accused her of learning verses secretly. She finished her tasks long before the others, and often, out of natural kindness or lack of something else to do, she would extricate one of her companions from a difficulty.

But what she preferred was to place herself with a book at the big table, as she did tonight—well propped up on her elbows, her hands on her forehead, her thumbs closing her ears as protection from Hela, who had never been able to run through a lesson without shouting at the top of her voice. The precaution was superfluous, for after a bit the little girl, fascinated by her reading, completely lost consciousness of what was happening around her.

This gift of absorption, the only oddity in a healthy child, afforded great amusement to her sisters and friends. A dozen times, with the boarders for accomplices, Bronya and Hela had organized a terrific hubbub around their

avidly reading sister with an even better hope to raise her eyes.

Today they wanted to try something really good; the presence of Henrietta Michalovska, Aunt Lucia's daughter, had aroused their evil demons. They crept forward on their toes and began to build a scaffolding of chairs about the motionless Manya, lost in her reading. Two chairs on each side, one behind, two others on top of the first three, and one at the summit crowning the edifice. . . . They retired in silence, and pretended to work. Then they waited.

They had to wait a long time. The child noticed nothing: neither the whispers nor the stifled laughter nor the shadow of the chairs above her head. For half an hour she remained like that, threatened, without knowing it, by the unstable pyramid. When her chapter was finished, she closed her book, lifted her head—and everything collapsed with a terrific noise. Chairs danced across the floor; Hela shrieked with joy; Bronya and Henrietta leaped nimbly into defensive positions, for a counter-attack was to be feared.

But Manya remained unmoved. She did not know how to be angry, but neither could she be amused at a trick which had frightened her. Her ash-grey eyes expressed the stupor of a sleepwalker suddenly jerked out of her dream. She rubbed her left shoulder, which a chair had struck a bit roughly, picked up her book and took it into the next room. Passing in front of the 'big girls' she said just two words:

'That's stupid!'

A calm verdict, with which the 'big girls' were not very satisfied.

These moments of total absent-mindedness were perhaps the only ones in which Manya found again the wonder-struck quality of her earliest childhood. She read poetry and scholastic manuals, adventure



THEY BEGAN TO BUILD A SCAFFOLDING OF CHAIRS

stories and technical works borrowed from her father's library.

And thus she put away from her, for brief moments at a time, the dark phantoms : she forgot Russian spies and the visits of Hornberg. She forgot her father's face, crushed by his miserable tasks, and the perpetual tumult of the house, and the black dawns when, still half asleep, she had to get up from her bed so that the boarders could have their breakfast in the dining-room, which was also a dormitory for the Sklodovski children.

She forgot her terrors : terror of the oppressor, religious terrors, terrors of illness and death. Instinctively she tried to escape from a ' climate ' too heavy for her.

They were fleeting respites. As soon as she regained consciousness everything came back to her at once : Zosia was dead. Mme Sklodovska was dead. Deprived of her mother's tenderness and the protection of her eldest sister, the child grew older, without once complaining, in partial abandonment. She was proud but she was not resigned. And when she knelt in the Catholic church where she was used to going with her mother, she experienced the secret stir of revolt within her. She no longer invoked with the same love that God who had unjustly inflicted such terrible blows, who had slain what was gay or fanciful or sweet around her.

CHAPTER III

ADOLESCENCE

THERE appears to be a moment of expansion, a sort of maximum, in the history of every family. Mysterious reasons force a generation to distinguish itself from others by abundance of gifts, magnificent excess of vitality, beauty, success.

This moment had arrived for the Sklodovski family, in spite of the tribute it had just paid to unhappiness. Death, carrying off Zosia, had taken a hostage from among five ardent and intelligent children. But the others, the four young people born of a consumptive mother and an intellectual worn out by work, carried an invincible force within them. They were to conquer adversity, to disdain all obstacles and to become, all four, exceptional human beings.

They were a superb spectacle, this sunny morning in the spring of 1882, gathered for breakfast around the table.

Only the two younger girls wore uniform now: Hela was still in blue, like a faithful child of the Sikorska school, but Manya was dressed in maroon, since she had become, at fourteen years of age, one of the most brilliant pupils of a government Gymnasium—the same Gymnasium where Bronya, the eldest of the three sisters, had finished her studies the year before by winning a gold medal and a great deal of glory.

Bronya was no longer a schoolgirl—she was a ‘young lady’. She had taken over the management of the house, replacing the housekeepers who had often been unpleasant. She kept the books, watched over the boarders, and wore her hair up and her skirts long like a grown person.

Joseph had been awarded a gold medal like Bronya’s when he left the boys’ high school. Envied and admired by his sisters, the young man was studying at the Faculty of Medicine. How lucky they thought him! Already tormented by intellectual ambition, the three Sklodovski girls grumbled at the rule forbidding women to enter the University of Warsaw; and they listened in rapt attention to their brother’s stories of student life in the ‘Tsar’s University’—mediocre though it was—where the teachers were ambitious Russians and subservient Poles.

Manya tied up her lunch and flung her schoolbag over her shoulder.

'Hurry up! You'll be late for your appointment!' Hela scoffed, getting ready in her turn.

'No, no, it's only half-past eight. Good-bye!'

On the stairs she passed two of her father's boarders who, although with less haste than herself, were making their way also to school.

Gymnasium, boarding-school, day school . . . the youth of Manya Sklodovska was completely obsessed by such words. M. Sklodovski taught in a Gymnasium, Bronya had just left the Gymnasium, Manya was going to a Gymnasium, Joseph to the university, Hela to Mlle Sikorska's boarding-school. Even their home was, in its way, a sort of school. Manya must have grown to imagine the universe as an immense school where there were only teachers and pupils and where only one ideal reigned: to learn.

Her bag on her back, Manya hastened, as she did every morning, to pick up her friend Kazia Przyborovska¹⁷ from her house. Kazia was very charming; cheerful and high-spirited, she was a happy little creature whose excellent parents did their best to spoil her. M. and Mme Przyborovski did likewise by Manya, whom they treated as one of their own daughters in an effort to make her forget that she was motherless. But by many little details in the appearance of the two girls in brown dresses it was easy to tell that one was a petted child, whose attentive mother brushed her hair and tied her ribbons every morning, while the other, at fourteen and a half years of age, was growing up in a house where nobody had time to bother about her.

Arm in arm the girls passed along narrow Zabia Street. They had not seen each other since tea on the day before, and they had a thousand urgent matters to discuss. Their thousand bits of gossip nearly all had to do with their

Gymnasium—a Russian school which, having been destined at first for the children of Germans in government service, kept its Germanic discipline and traditions.

It had been a great change, after Mlle Sikorska's profoundly Polish seminary for young ladies, to become the pupil of an official institution governed by the Russian spirit. It was a necessary change—since the Imperial Gymnasias were the only ones which bestowed recognized diplomas—but Manya and Kazia avenged themselves on it by making all manner of fun of their teachers from Russia, as well as of the boring Pastor Meding, their German teacher, and above all of Mlle Mayer, the detested and detestable superintendent of studies.

Mayer, a tiny, dark woman with greasy hair, who wore silent spy's slippers, was the declared enemy of Manya Sklodovska. She reproached Manya with everything: her stubborn character and the 'scornful smile' with which, according to Mayer's story, Manya received the most wounding criticism.

'That Sklodovska! It's no use talking to her—it's just like throwing peas against a wall!' the superintendent groaned. She was particularly annoyed by Manya's curly hair, which she declared 'disordered and ridiculous'; with many a heavy stroke of the brush she tried to straighten out the rebellious locks and transform the Pole into a Gretchen¹⁸ with tight braids. Useless! After a few minutes the light, capricious curls would break out again about the young face, and Manya's too innocent gaze was fixed with singular insistence upon the superintendent's shining braids.

'I forbid you to look at me like that!' Mayer spluttered. 'You mustn't look down at me!'

In a fit of impertinence one day Manya, who was a head taller than Mayer, replied: 'The fact is that I can't do anything else.'

War went on, day after day, between the sour old maid

and the fractious pupil. The worst of the storms had taken place the year before. Mlle Mayer, coming into the classroom unexpectedly, had found Manya and Kazia dancing with joy among the desks to celebrate the assassination of Tsar Alexander II, whose sudden death had just plunged the empire into mourning.

One of the most melancholy results of political constraint is the spontaneous ferocity it develops among the oppressed. Manya and Kazia felt such rancours as free human beings never know. Even though they were by nature tender and generous, they lived in accordance with a particular morality—the slave morality—which turns hatred into a virtue and obedience into cowardice.

On their way to school they passed through the Saxony Garden which was one of Manya's favourite spots in that city which she was to call, for years to come, 'my beloved little Warsaw'.

'They're dancing at home this evening,' Manya said.

'Are you coming to watch them?'

'Yes. Oh, Manyusya, when shall we have the right to dance, too? We're such good waltzers already!' Kazia complained impatiently.

When? Not until school was over and the girls had 'come out'. They were only allowed to practise among themselves and to learn the dances from the school ballet master. Relegated to little chairs at the side, they were also present when the young people of a few friendly families gathered for dancing lessons once a week in the Sklodovskis' house.

But before they could expect their turn to come they must pass more months in the Gymnasium which now rose before them in the avenue. Their comrades were already plunging into the archway. There was the little blue-eyed Wulf girl, and Anya Rottert, the flat-nosed German who was the best in the class after Manya; and Léonie Kunicka.¹⁹

But what was the matter with Kunicka? Her eyes were swollen with tears; and she, who was always so neatly dressed, seemed to have had her clothes thrown at her today.

Manya and Kazia ceased smiling and ran toward their friend.

'What's the matter? What has happened to you Kunicka?'

Kunicka's delicate face was colourless. The answer passed her lips with difficulty.

'It's my brother. . . . He was in a plot. . . . He was denounced. . . . We didn't know where he was for three days.'

Stifled by sobs, she added:

'They are going to hang him tomorrow.'

The other two girls, horror-struck, surrounded the unlucky one with their questions and their support; but the sharp voice of Mlle Mayer broke in with brief orders:

'Come, come, young ladies, enough of your chatter. Hurry up.'

Stunned with shock, Manya made her way slowly towards her place. Just before she had been dreaming of music and dances. Now, while the first phrases of a geography lesson to which she was not attending rumbled in her ears, she saw the young face of the condemned boy—and the scaffold, the hangman, the rope.

That night, instead of going to the dancing lesson, six girls kept silent watch in Léonie Kunicka's narrow room. Manya, Hela and Bronya came with Kazia and her sister Ula²⁰ to wait for the dawn with their comrade.

They mingled their rebellion and their tears. They took humble and tender care of their friend, convulsed as she was with grief; they bathed her swollen eyes, obliged her to drink a little hot tea. The hours passed somehow, so fast, so slow, for the six children of whom

four still wore their school uniform. When the pallor of dawn, accentuating their own pallor, came to mark the moment of the end, they fell on their knees and said a last prayer, their hands concealing their young faces full of terror.

One gold medal, two gold medals, three gold medals in the Sklodovski family. The third was for Manya and marked the end of her secondary studies on 12 June 1883.

In stifling heat the list of rewards was read. Speeches and the flourish of trumpets; the congratulations of the teachers; a limp shake of the hand from M. Apushtin, grand master of education in Russian Poland, answered by a last curtsy from Manya. In her black dress of ceremony with a bunch of tea roses pinned at the waist, little Sklodovska said her farewells and swore she would write to her friends every week; then, laden with Russian prize books which she loudly declared to be 'horrible' (as it was her last day, what did she risk?), she left the school for ever, escorted by her father whom her success had overwhelmed with pride.

Manya had worked very hard—and very well. M. Sklodovski decided that she was to go to the country for a year before choosing her means of livelihood.

A year's holiday! . . . One might be tempted to imagine the child of genius, obsessed by an early vocation, studying scientific books in secret. But such was not the case. Manya suddenly became lazy. Abandoning the school-books, she tasted, for the first and last time in her life, the intoxication of idleness.

A rural interlude occurs here in the story of the professor's daughter. 'I can't believe geometry' or algebra ever existed,' she writes to Kazia. 'I have completely forgotten them.' She was staying far from Warsaw and school, with relations in the country who welcomed her for weeks at a time in exchange for vague

lessons to be given to their children, or for a tiny payment of board ; and she gave herself up to the sweetness of being alive.

How carefree she was ! How young and happy, suddenly—so much younger than in the dark days of her childhood !

She romped and played and swam—she went for picnics in the wood—she learned to ride, she went to *kuligs*²¹ and dances and she was seized with a passion for the country which she was never to lose.

Many years later my mother sometimes evoked those happy days for me. I looked at her tired face, worn out by nearly half a century of care and immense toil. And I thanked the destiny which had allowed her to follow by sleigh after the wildest *kuligs*, and to wear out her shoes in one night of dancing.

CHAPTER IV

VOCATION

IN September, still giddy from a whole year's roaming, Manya took the road to Warsaw again, to the family's new lodging near the Gymnasium where she had lived in her childhood.

That year, upon which their whole future depended, the situation of the young people was far from brilliant.

The problem was simple : the head of the family was barely able to pay for rent, food and a servant on his slender salary, which was soon to be succeeded by an even slenderer pension. Joseph, Bronya, Hela and Manya would have to earn their living.

The first idea that came to these children of two teachers was naturally that of giving lessons. ' Medical student will do private tutoring.' Or (another advertisement) :

'Lessons in arithmetic, geometry, French, by young lady with diploma. Moderate fees.' The Sklodovskis entered the ranks of the hundreds of young intellectuals who were looking for work in Warsaw.

It was an ungrateful job. Before she was seventeen Manya had learned to know the fatigues and humiliations that attended it: the long walks across town, in rain and cold; the stubborn or lazy pupils; the parents who made one wait for ever in draughty halls ('Tell Mlle Sklodovska to wait; my daughter will be there in a quarter of an hour!') or who, out of sheer giddiness, forgot to pay the few roubles they owed one at the end of the month—those roubles so anxiously expected, that one had counted on having that very morning!

The winter advanced. At home life was dull and each day resembled the one before.

It might be supposed that Manya was at this time a young lady without a dowry, active and sensible, whose only interest was in building up her list of pupils. The supposition would be untrue. She had bravely accepted the toilsome life of giving private lessons, by necessity; but she had another life, passionate and secret. Like every Pole of her place and time she was exalted by dreams.

There was one dream common to all youths: the dream of nationhood. In their projects for the future, the desire to serve Poland took precedence of personal ambition, of marriage and of love. One would dream of violent struggle and would organize conspiracies at the risk of his life; another would dream of action by means of controversy; still another would take refuge in mystic dreaming—for the Catholic religion was also a resource, a force of resistance against the Orthodox²² oppressor. And even though she had among her friends some revolutionary patriots, to whom she lent her passport in time of danger, Manya did not indulge the alternative

dream of taking part in assassinations, throwing bombs at the Tsar's carriage or at the governor of Warsaw. There was a powerful movement just starting, among the intelligentsia to which the young girl belonged, to discard and forget all vain chimeras—sterile regrets and disordered impulses toward independence. For them only one thing counted: to work, to build up a magnificent intellectual capital for Poland, and to develop the education of the poor, whom the authorities deliberately maintained in darkness.

In free countries this current of ideas was allowed to develop publicly; but such was not the case in Poland, where every manifestation of independence of mind was regarded with suspicion. The new theories made their way and spread by underground routes.

Soon after her return to Warsaw, Manya Sklodovska, along with her sister Bronya, was admitted to the underground 'Floating University'. There she received lessons in anatomy, natural history and sociology. The sittings took place in secret in the house of one or other of the members. The students gathered to the number of eight or ten at a time and took notes: they passed pamphlets and articles from one to the other; at the slightest noise they trembled, for if they had been discovered by the police it would have meant prison for all of them.

The aim of the Floating University was not only to carry on the instruction of young people just out of the secondary schools. In their turn the students were to become educators. Manya began to give lessons to women of the poor. She began by reading aloud to the employees of a dressmaking establishment and got together a little library of books in Polish, volume by volume, for the use of the working women.

How is one to imagine the fervour of this girl of seventeen? Her childhood had been passed before mysterious divinities, the physics apparatus in her

father's study ; even before the sciences had been made 'fashionable', M. Sklodovski had transmitted his passionate curiosity to her. But that world was not enough for impetuous Manya ; she plunged eagerly into other sections of the world's knowledge. With her advanced ideas and her generous soul she was, in the pure sense of the word, a Socialist. Before everything and above everything she wanted to serve her country.

She did not yet know that the time would come when she must choose between these dreams. She had confounded, in the same exaltation, her patriotic feeling, her humanitarian ideas and her intellectual aspirations.

By some miracle she remained charming in the midst of such doctrines and such excitements. The strict, high-minded education she had received, the example of the modest creatures who had watched over her youth, protected her from excess. There was a cool and moderate dignity in her nature, an innate gravity that accompanied her enthusiasm—not to say her passion. We shall never see her affect any snobbishness of revolt or bad manners. She will never even have the wish to light an innocent cigarette.

Bronya and Manya passed many hours together attempting to draw up a plan of their future lives. Unfortunately, no one could point out a means of obtaining higher education for them in a city where the university was closed to women ; nor supply a magic formula for getting rich quickly on lessons at half a rouble an hour.

And Manya's generous heart grieved. There was the instinct of a Newfoundland dog in the child, youngest of her family ; she felt responsible for her father's future, for the future of her elders. Joseph and Hela, luckily, gave her no cause for worry ; the young man was going to be a doctor, and the lovely, stormy Hela, hesitating between a teacher's profession and a career as a singer,

sang at the top of her voice and acquired diplomas and refused offers of marriage all at the same time.

But Bronya! How could Bronya be helped? Ever since she had left school four years ago all the cares of the household had fallen upon her. By dint of buying food, inventing menus and presiding at the preparation of preserves, she had become a remarkable housekeeper—and she was in despair at being only that. Manya understood the torments of her elder sister, whose great secret wish was to go to Paris and study medicine, then to return to Poland and practise in the country. The poor girl had saved a little money, but it cost so much to go abroad! How many months or years would she have to wait?

Manya was so made that her sister's visible anxiety and discouragement became her constant preoccupation, in which her own ambition was forgotten. She forgot that she, too, had often dreamed of traversing the thousands of miles that separated her from the Sorbonne,²³ there to quench the thirst for knowledge that was her essential characteristic, and of bringing back the precious learning to her work as an educator in Warsaw, among her beloved Poles.

If she took Bronya's career so to heart, it was because finer bonds than those of blood attached her to the girl whose exquisite affection had given her maternal support since the death of Mme Sklodovska.

One day when Bronya was scribbling away at a piece of paper, counting how much money she had—or rather how much she lacked—Manya made a direct attack.

'I have reflected a lot just lately. I have also talked to Father. And I think I've found a way.'

'A way——?'

Manya came nearer to her sister; what she had to say and get accepted was delicate; she would have to weigh her words with prudence.

'Let's see. With what you have saved, how many months could you live in Paris?'

'I have enough to pay my journey and one year's expenses at the Faculty,' Bronya answered quickly. 'But the medical course lasts five years, you know very well.'

'Yes. But you understand, Bronya, that with lessons at half a rouble a time we shall never be able to do it.'

'Well?'

'Well, we could make an alliance. If we keep on struggling separately, each on her own account, neither of us can ever get away. Whereas on my system you can take the train in the autumn—in a few months.'

'Manya, you are mad!'

'No. To start with, you will spend your own money. After that I'll arrange to send you some; Father too. And at the same time I'll be piling up money for my own future studies. When you are a doctor it will be my turn to go. And then you will help me.'

Bronya's eyes filled with tears. She felt the greatness of the offer; but one point remained obscure in Manya's programme. 'I don't understand. You don't hope to make enough money for your own support and part of mine and then still more to save, do you?'

'Exactly that,' said Manya casually. 'That's where my system comes in. I am going to get a job as governess in a family. With board, lodging and laundry all free, I shall have four hundred roubles a year in wages, perhaps more. You see how that will settle everything.'

'Manya. . . little Manyusya.'

It was not the choice of position that moved Bronya: like a good idealist she shared her sister's scorn for social prejudices. No; it was the idea that Manya could condemn herself for years to cruel waiting in an unattractive profession so that she, Bronya, could begin her studies immediately. She resisted.

'Why should I be the first to go? Why not the other way round? You are so gifted—probably more gifted than I am. You would succeed very quickly. Why should I go?'

'Oh, Bronya, don't be stupid! Because you are twenty and I'm seventeen. Because you've been waiting for hundreds of years and I've got lots of time. That's what Father thinks too; it is only natural that the elder should go first. When you have your practice you can bury me in gold—in fact, I count on it. We're doing something intelligent at last, something that will work.'

Soon Manya became a governess in a wealthy Warsaw family and hated it. She had hoped, by taking a place in Warsaw, to earn respectable sums of money without condemning herself to painful exile. To remain in the city was a mitigation of the sentence: it meant staying near home and being able to go every day and talk for a bit with her father. It meant keeping up contact with her friends of the Floating University and being able—perhaps—to attend a few evening courses.

But this sacrifice was not enough: she could not earn enough money, and above all she spent too much. Her salary, frittered away in little daily purchases, left her with insignificant savings at the end of the month. She had yet to prepare herself to subsidize Bronya, who had gone to Paris and was living in poverty in the Latin Quarter.²⁴ And then, too, M. Sklodovski's retirement was drawing near. Soon the old man would need help. What was she to do?

Manya did not hesitate for long. She had heard of a good post as governess in the country two or three weeks before. No sooner said than done. She would accept the distant province, the leap into the unknown. It would be years of separation from those she loved, total isolation. What did that matter? The salary was good,

and in that forgotten village the expenses were reduced practically to nothing.

'And I love the open air so much!' Manya told herself. 'Why didn't I think of it sooner?'

So she went to Szczuki²⁵—the little estate, one hundred kilometres²⁶ from Warsaw, of the 'Z' family. Her dull conventional existence was wearing her down when, one day, meeting some little peasants in the muddy road, boys and girls miserably dressed, with bold faces under their hempen hair, she conceived a plan. Why should she not put into practice, in this small world of Szczuki, those progressive ideas which were so dear to her? Last year she had dreamed of 'enlightening the people'. Here was an excellent opportunity. The village children were for the most part illiterate. If any of them had been to school at any time, they had only learned the Russian alphabet there. How fine it would be to create a secret course in Polish, to awaken these young brains to the beauty of the national language and history!

The governess submitted her idea to Bronka 'Z', her eighteen-year-old pupil. She was enthusiastic about it and decided to help.

'Think it over carefully,' said Manya, to calm her enthusiasm. 'You know that if we are denounced we shall be sent to Siberia.'

But nothing is more contagious than courage: in the eyes of Bronka 'Z', Manya saw ardour and resolution. There was only the authorization of the head of the family to be obtained, and they could begin their discreet propaganda in the peasant huts.

But it was not enough for Manya to listen to her pupils repeating their lessons. When all that was done, the dauntless girl went up to her room and waited until a noise of boots on the stairs, mingling with the shuffle of bare feet, announced the arrival of her students. She had borrowed a pine table and some chairs so that they

could practise their writing comfortably. She had taken enough from her savings to buy them some copy-books and the pens which the numbed little fingers managed with such difficulty. When seven or eight young peasants were installed in the big room with chalked walls, Manya and Bronka 'Z' were barely able to maintain order and rescue the unhappy pupils who, sniffing and snorting with anguish, could not spell a difficult word.

These sons and daughters of servants, farmers and factory workers, who pressed round Manya's dark dress and fair hair, were not always well washed. They did not smell nice. Some of them were inattentive and sullen. But in most of their bright eyes appeared a violent desire to accomplish, some day, those fabulous acts: reading and writing. And when this humble end was achieved, when the big black letters on white paper suddenly took on meaning, the young girl's heart contracted at the noisy prideful triumph of the children and the wondering admiration of their illiterate parents who sometimes stationed themselves at the end of the room to watch the lessons. She thought of all this goodwill wasted, and of the gifts that perhaps lay hidden in these baulked and defrauded creatures. Before their sea of ignorance she felt disarmed and feeble.

Marya Sklodovska wanted to study in France more than in any other country. The prestige of France dazzled her. In Berlin and Petersburg the oppressors of Poland reigned; but in France liberty was cherished, all feelings and all beliefs were respected, and there was a welcome for the unhappy and the hunted, no matter whence they came. Was it true, was it even possible, that some day she might take the train for Paris—that this great happiness might be given her?

She had lost hope of it. When she stopped to consider, Manya saw before her a clear situation which was apparently without issue. In Warsaw there was her

father, who would soon have need of her. In Paris there was Bronya, who must be helped for years more before she could earn a penny. And on the estate of Szczuki there was herself, Manya Sklodovska, governess. The project of amassing a capital, which once had seemed practical to her, now made her smile. It was a childish plan. One does not escape from a place like Szczuki.

It is fine to see, in the despondency of this creature of genius, that she was not invulnerable—that, far from preserving an inhuman confidence, she suffered and grew discouraged like any other girl of nineteen. It is fine to see her contradict herself and, in the very moment when she claims to have renounced everything, struggle with ferocious heroism against her own burial. It was indeed an all-powerful instinct that made her sit every night at her desk, reading volumes of sociology and physics borrowed from the factory library, or perfecting her knowledge of mathematics by correspondence with her father.

The task was so ungrateful that it is astonishing to see Manya persevere in it. All alone in that country house she was without direction or advice.

In her moments of dismay she resembled her little peasants when they despaired of ever learning to read and threw their alphabets away; but nevertheless, with a peasant's stubbornness, she pursued her effort.

CHAPTER V

ESCAPE TO PARIS

THREE years had passed since 'Mlle Marya' became a governess. But now, by small imperceptible stages, the tragic immobility of the young girl's existence was beginning to stir. In Paris, in Warsaw and at Szczuki

certain events, small in appearance, modified the play of the mysterious game in which Manya's lot was decided.

M. Sklodovski, having obtained his pension, started out in search of lucrative employment. He wanted to try to help his daughters. In April 1888, he accepted the most arduous and ungrateful of posts: the directorship of a reform school not far from Warsaw. The atmosphere, the surroundings, everything was unpleasant there—everything but the comparatively high salary, from which the good man instantly set aside a monthly sum for Bronya.

The first thing Bronya did was to direct Manya not to send her any more money. The second was to ask her father to hold eight roubles out of the forty roubles he gave her every month—eight roubles destined to repay, little by little, the sums she had received from her little sister. From that moment Manya's fortune, starting from zero, began to increase.

The medical student's letters brought other news from Paris. She was working. She was passing her examinations with success. And she was in love: in love with a Pole, Casimir Dluski,²⁷ her comrade in study, brilliant with charm and good qualities, whose only awkward peculiarity was that he was forbidden to live in Russian Poland and was threatened with deportation to Siberia if he returned there.

At Szczuki, Manya's task was approaching its end. Soon the 'Z's' would no longer need her services. Naturally she would have to find another place. The young governess already had one in view, with some rich industrialists of Warsaw, the 'F's'. It would be a change at any rate—the change that Manya called for so eagerly.

The year to come was to be a comparatively pleasing interval for the young girl. Mme 'F' was very beautiful, very elegant, very rich. During this time Manya became acquainted, as a spectator, with the frivolous and

charming things wealth can offer a spoiled woman—things that she was never to possess. First and last meeting with luxury! It was made agreeable by Mme 'F's' graciousness; that lady, attracted by the 'exquisite Mlle Skłodowska', sang Manya's praises and required her to be present at all the tea-parties, all the dances.

Suddenly, one day, the thunderbolt: the postman brought a letter from Paris. It was a hurried letter on squared paper, which Bronya had scribbled between two sessions in the operating theatre; in it the generous girl, who was about to marry Casimir Dluski, offered Manya hospitality in her new home for the coming year.

One might think that the enthusiastic Manya would have answered her sister at once to say that she was exultant with happiness and was coming; but not at all. Years of exile and loneliness, instead of souring this extraordinary girl, had made her over-scrupulous. Her sacrificial demon could make her capable of deliberately missing her destiny. Because she had promised to live with her father; because she wanted to help her sister Hela and her brother Joseph, Manya no longer wished to go.

Bronya insisted, argued. Unfortunately, she lacked the decisive argument: she was too poor to pay the travelling expenses of her young sister and to put her authoritatively into the train. Finally it was decided that when Manya had finished her engagement with Mme 'F' she would remain still another year in Warsaw. She would live with her father, recently freed from his work; she would complete her savings by giving lessons; and thereafter she would go.

After the torpor of the provinces and the agitated gaieties of the 'F's', Manya returned to the climate that was dear to her: a lodging of her own, the presence of old Professor Skłodowski, and conversations interesting

enough to stimulate her mind. The Floating University again opened its mysterious doors to her. And—incomparable pleasure, major event!—Manya, for the first time in her life, penetrated into a laboratory.

One of Manya's cousins, Joseph Boguski, directed what was pompously called 'The Museum of Industry and Agriculture'. This title, wilfully pretentious and vague, was only a front to present to the Russian authorities. A museum would not arouse suspicion. Nothing prevented the teaching of science to young Poles behind the windows of a museum.

Coming home late at night, regretfully leaving electrometers, test-tubes and accurate balances, Manya undressed and lay down on her narrow bed. But she could not sleep. An exaltation different from all those she had known kept her from sleep. Her vocation, for so long uncertain, had flashed into life. She was summoned to obey a secret order. She was suddenly in a hurry, whipped onward. When she took the test-tubes of the Museum of Industry and Agriculture into her fine, clever hands, Manya returned, as if by magic, to the absorbing memories of her childhood, to her father's physics apparatus, motionless in its glass case, with which, in the old days, she had always wanted to play. She had taken up the thread of her life again.

But although she tried to conceal her impatience to leave Poland a day came when she could wait no longer. She counted up all the hard years of boiling patience through which she had just lived. It was eight years since she had left the Gymnasium, six years since she had gone out as governess. She was no longer the adolescent who saw her whole life before her. In a few weeks she would be twenty-four.

Suddenly she cried out: she called to Bronya for help.

If Bronya did not reply by telegram it was because telegrams were a ruinous luxury. If Manya did not fling

herself into the first train it was because she had to organize the great departure first, with parsimonious economy. She spread out on the table all the roubles she possessed, and to them her father, at the last moment, added a little sum which for him was an important one. And she began her calculations.

So much for the passport, so much for the railway. It would be sheer flightiness to take a third-class ticket from Warsaw to Paris—the cheapest way in Russia to France. There existed in Germany—thank God!—railway carriages of the fourth class, without compartments, almost as bare as goods wagons; a bench on each of the four sides and an empty space in the middle where, seated on a folding chair, one was not badly off.

Practical Bronya's recommendation was not forgotten: to take along everything necessary to life, so as to have no unforeseen expenses in Paris. Manya's mattress, her bedclothes, her sheets and towels, would leave long in advance, by freight. Her linen, made of strong cloth, her clothes, her shoes and her two hats were collected on a couch near which—unique and gorgeous purchase!—gaped the big wooden trunk, brown and bulging, very rustic but very solid, on which the girl had lovingly had painted her initials in broad black letters: M.S.

With the mattress gone and the trunk registered, there remained all sorts of awkward packets for the traveller, her companions on the journey: food and drink for three days on the train, the folding chair for the German carriage, books, a little bag of sweets. . . .

It was only after she had lodged these burdens in the net of the compartment and reserved her place on the narrow, hard bench that Manya stepped down to the platform again. How young she looked in her big threadbare coat, with her fresh cheeks and grey eyes which sparkled today with unwonted fever!

Suddenly moved, tormented again by scruples, she

kissed her father and overwhelmed him with tender, timid words which were almost excuses.

‘ I shall not be away long. . . . Two years, three years at the longest. As soon as I have finished my studies, and passed a few examinations, I’ll come back, and we shall live together and never be separated again. . . . Isn’t that right ? ’

‘ Yes, my little Manyusya,’ the professor murmured in a rather hoarse voice, clasping the girl in his arms. ‘ Come back quickly. Work hard. Good luck ! ’

In the night pierced with whistles and the clank of old iron the fourth-class carriage was passing across Germany. Crouched down on her folding chair, her legs muffled up, her luggage—which she carefully counted from time to time—piled close around her, Manya tasted her divine joy. She mused upon the past, upon this magic departure for which she had waited so long. She tried to imagine the future. In her humility she thought that she would soon be back again in her native town, that she would find a snug little place as teacher there.

She was far, very far, from thinking that when she entered this train she had at last chosen between obscurity and a blazing light, between the pettiness of equal days and an immense life.

At the moment when Manya, dulled by the tiresome journey, arrived in Paris, the familiar grip of servitude was suddenly loosened, her shoulders straightened, her lungs and heart felt at ease. For the first time she was breathing the air of a free country, and in her enthusiasm everything seemed miraculous : miraculous that the passers-by who loitered along the pavement spoke the language they wanted to speak, miraculous that the booksellers sold works from the whole world without restraint. Before and above everything else, it was miraculous that these straight avenues, inclined in a gentle slope toward the heart of the city, were leading her, Manya Sklodovska,

to the wide open doors of a university. And what a university! The most famous; the one described centuries ago as 'an abridgement of the Universe'; the very one of which Luther had said: 'It is in Paris that we find the most celebrated and most excellent of schools: it is called the Sorbonne.'

The carriage crossed the Seine and everything around Manya became delightful: the two arms of the misty river, the majestic islands full of grace, the monuments, the squares, and down there, on the left, the towers of Notre Dame. . . . To get up the Boulevard Saint-Michel the horses slowed down to a walking pace. It was there—there—she had arrived!

The student seized her portfolio and gathered up the folds of her heavy woollen skirt. In her haste she carelessly bumped into one of her neighbours, and excused herself timidly, in hesitating French. Then, having leaped down the steps from the 'imperial',²⁸ she was in the street, with intense face, running towards the iron gate of the palace.

On a white poster stuck on the wall near the porter's lodge she read:

FRENCH REPUBLIC
FACULTY OF SCIENCES—FIRST QUARTER

COURSES WILL BEGIN AT THE SORBONNE
ON 3 NOVEMBER 1891

The magic, sparkling words!

With the small amount of money she had saved, rouble by rouble, the girl had won the right to listen to such lessons, among the innumerable ones in the complicated list on the poster, as it would please her to choose. She had her place in the experimental laboratories, where, guided and advised, she could handle

apparatus without fumbling and succeed in some simple experiments. Manya was now—oh, delight!—a student in the Faculty of Science.

In fact she was no longer called Manya, or even Marya : on her registration card she had written, in the French style, ' Marie Sklodovska '. But as her fellow-students could not succeed in pronouncing the barbarous syllables of ' Sklodovska ', and the little Polish girl gave nobody the right to call her Marie, she kept a sort of mysterious anonymity.

Unforeseen obstacles had suddenly raised themselves before her during the first weeks. She had thought that she knew French perfectly ; she had been wrong. Some entire sentences, when said too rapidly, escaped her. She thought she had had sufficient scientific preparation to pursue the courses of the university. But her solitary work in the country, in the governess's room, the knowledge she had acquired by correspondence with M. Sklodovski, and the experiments attempted by hook or crook in the Museum of Industry and Agriculture, did not take the place of the solid baccalaureate²⁹ training of the Paris schools. In mathematics and physics Marie discovered enormous holes in her ' culture '. How she would have to work to win the enviable, magnificent title, which she coveted every instant : Master of Science !

Paul Appell was lecturing today : clarity of exposition and picturesque style. Marie was one of the first to arrive. Powerful and tranquil, he ventured into the most tenuous regions of knowledge, he played with numbers, with the stars ; and as he was not afraid of imagery he pronounced in the most natural tones, accompanying the words with the easy gesture of a great property owner :

' I take the sun, and I throw it . . . '

The Polish girl on her bench smiled with ecstasy. Under

her great swelling forehead her grey eyes, so pale, were illuminated with happiness. How could anybody find science dry? Was there anything more enthralling than the unchangeable rules which governed the universe, or more marvellous than the human intelligence which could discover them? How empty all novels seemed, and how fairy-tales lacked imagination alongside these extraordinary phenomena, related among themselves by harmonious principles—this order in apparent disorder! An impulse comparable only to love sprang up from the soul of the girl towards the infinite of knowledge, towards things and their laws.

‘I take the sun, and I throw it . . .’

It was worth while struggling and suffering far away during all those years to hear that little phrase pronounced by the peaceful and majestic scientist.

Marie was perfectly happy.

She flung herself ardently into whatever her new existence offered. She worked as if in a fever. She also discovered the joys of comradeship, of that solidarity which university work creates. But, still too shy to make friends with the French, she took refuge among her compatriots.

But soon the students’ frequent meetings and revels distracted her from working in peace and gradually she drew away from them.

Another problem presented itself. In the Rue d’Allemagne, where she lived with her sister Bronya and Bronya’s husband Dr Casimir Dluski, life was charming and sweet; but Marie could not find perfect concentration there. She could not stop Casimir from playing the piano, receiving friends, or coming into her room while she was solving a difficult equation; she could not stop the young doctor’s patients from breaking into the house. At night she was abruptly awakened by the ring of the bell and the footsteps of messengers who came to get Bronya for the confinement of some butcher’s wife.

Above all it was terribly inconvenient to live so far out : one hour's journey to the Sorbonne ! And the price of two omnibus fares was, in the long run, exorbitant. After a family council of war, it was decided that Marie should go to live in the Latin Quarter, near the university, the laboratories and the libraries. The Dluskis insisted on lending the girl the few francs that her moving would cost, and on the next morning Marie started her campaign, visiting attics to let.

It was not without regret that she left the little flat in the neighbourhood of the slaughter-house, lost in prosaic surroundings but filled as it was with tenderness, courage and good temper. Between Marie and Casimir Dluski a fraternal affection had been formed which was to last out their lives. Between Marie and Bronya a magnificent romance had been unfolding for years past : the romance of sacrifice and devotion, of mutual help.

CHAPTER VI

FORTY ROUBLES A MONTH

YES, Marie's existence had still further to be despoiled and made bare. The few months she had lived in the Rue d'Allemagne had been a stage in acclimatization. Now the girl sank slowly into solitude. The beings she rubbed shoulders with existed for her no more than the walls she touched in passing, and conversation hardly cut in upon the silence in which she enveloped her hours. For more than three solid years she was to lead a life devoted to study alone : a life in conformity with her dreams, a ' perfect ' life in the sense in which that of the monk or the missionary is perfect.

Her life had to be of monastic simplicity in any case :

for since Marie had voluntarily deprived herself of the board and lodging she had had at the Dluskis', she had to meet her expenses herself. And her income—made up by her own savings, divided into slices—and the small sums her father could send her was only forty roubles³⁰ a month.

How could a woman, a foreigner, live decently in Paris in 1892 with forty roubles a month, paying for her own room, meals, clothes, paper and books, as well as her fees at the university? Such was the problem the young student had urgently to solve. But Marie never failed to find the solution of a problem.

She was not the only student who lived on a hundred francs a month in the Latin Quarter: most of her Polish comrades were as poor as she was. Some lived by threes or fours in the same lodging and took their meals together; others, who lived alone, devoted several hours a day to housekeeping, cooking and sewing, and by sheer ingenuity ate as much as they wanted, shod and clothed themselves in greater or lesser elegance. This was the method adopted earlier by Bronya, whose talents as a prize cook had been celebrated among her comrades.

Marie disdained to follow such wise examples: she was too fond of her tranquillity to share her lodging with a friend or two and too haunted by work to bother about her own comfort. Even if she had wished to do so, for that matter, she would have been incapable of it: the girl who had been a governess in strange families at seventeen, giving seven or eight hours of lessons a day, had never found time or occasion for learning how to keep house. Everything that Bronya had learned when she was mistress of her father's house was unknown to Marie. And rumour had it, in the Polish colony, that 'Mademoiselle Sklodovska' doesn't know what you use to make soup'.

She did not know, and she did not want to know. Why should she pass a morning initiating herself into the

mysteries of a broth, when she might have been learning several pages of physics or making an interesting analysis in the laboratory?

By deliberate intention she had suppressed diversions from her work, as well as friendly meetings and contact with human beings. In the same way she decided that material life had no importance; that it did not exist. And, fortified by this principle, she made for herself a spartan existence, strange and inhuman.

All the rooms Marie was to inhabit were alike in discomfort and cheapness of rent. The first was situated in a poorly furnished house where students, doctors and officers of the neighbouring garrison lived. Later on, the girl, in search of absolute calm, was to take an attic like a servant's room at the top of a middle-class house. For fifteen or twenty francs a month she found a tiny nook which was lit from a loop-hole giving directly on the slope of the roof. Through this skylight appeared a small square of the sky. There was no heat, no lighting, no water.

Marie furnished this place with all the objects she possessed: an iron folding bed, the mattress she had brought from Poland, a stove, a white wooden table, a kitchen chair, a wash-basin; a petroleum oil lamp, covered by a twopenny shade; a pitcher which she had to fill at the tap on the landing; an alcohol heater about as big as a saucer, which was to cook her meals for the next three years; two plates, a knife, a fork, a spoon, a cup, a stew-pan; and finally a kettle and three glasses into which, according to Polish custom, the student would pour tea when the Dluski came to see her. On the occasions—very rare at present—when Marie received visitors, the rights of hospitality were asserted: the girl lighted the little stove, whose zig-zag pipe described complicated angles in the room, and for a seat she pulled out of its corner the bulging brown trunk which served her as wardrobe and chest of drawers.

No service, of course : even one hour of cleaning a day would have overweighted the expense side of the budget. Transportation costs were suppressed : Marie went to the Sorbonne on foot in all weathers. Coal was kept down to a minimum : one or two sacks of 'lumps' for the winter, which the girl brought from the merchant on the corner and hoisted up the steep stairs herself to the sixth floor, bucketful by bucketful, stopping at each floor to breathe. Lights were at a minimum : as soon as night fell, the student took refuge in a library where the gas was lighted and it was warm. Seated at one of the big rectangular tables with her head in her hands, a poor Polish girl could work until they closed the doors at ten o'clock. From then on all that was needed was enough oil to keep the light going in her room until two in the morning. Then, with her eyes reddened by fatigue, Marie left her books and threw herself on the bed.

The only thing she knew how to do, in the humble practical domain, was to sew—a memory of the 'manual training' at the Sikorski boarding-school and of the long days in Szczuki when the governess, as she supervised the children's study, took up her sewing. It would be rash to conclude from this that the exile ever, by chance, bought a bit of stuff at a low price and made herself a new blouse. She seems to have sworn, on the contrary, never to give up her Warsaw dresses, and wore them, shiny, old-fashioned and threadbare, for ever. But she took great care of her clothes, cleaned them and mended them. She also condescended to wash her linen in a basin when she was too tired to work and needed relaxation.

Marie did not admit that she could be cold or hungry. In order not to buy coal—and through sheer carelessness too—she often neglected to light the little stove with the twisted pipe, and wrote figures and equations without noticing that her fingers were getting numb and her shoulders shaking. Hot soup or a bit of meat would have

comforted her—but Marie did not know how to make soup. Marie could not spend a franc and lose half an hour to cook herself a chop. She hardly ever entered the butcher's shop, much less the restaurant: it was too dear. For weeks at a time she ate nothing but buttered bread and tea. When she wanted a feast, she went into a creamery in the Latin Quarter and ate two eggs, or else bought herself a piece of chocolate or some fruit.

On this diet the fresh, solid girl who had left Warsaw a few months before rapidly grew anemic. Often, as she was getting up from her table, her head would go round. She had just time to get to her bed when she would lose consciousness. Coming back to herself, she would ask why she had fainted; she would think herself ill and dislain her illness as she did everything else. It never occurred to her that she was dropping with weakness and that her only disease was that of starvation.

Naturally, she did not boast of this superb organization of existence to the Dluskis. Every time she went to see them she replied in monosyllables to their questions on her progress as a cook, or on her daily menus. If her brother-in-law said she did not look well, she affirmed that she was overworked—which was, in fact, in her eyes, the only reason for her fatigue. And then, dismissing such worries with a gesture of indifference, she would begin to play with her niece, Bronya's baby, for whom she had great affection.

But one day, when Marie fainted in front of one of her comrades, the latter hurried to the Rue d'Allemagne to warn the pair of young doctors. Two hours later Casimir was leaping up the six flights of stairs to the attic where the girl, a little pale, was already studying tomorrow's lesson. He examined his sister-in-law. He examined even more carefully the clean plates, the empty stewpan, and the whole room, in which he could discover only one questionable, a packet of tea. All at once he understood—and the questioning began.



THE GIRL WAS ALREADY SLEEPING TOMORROW'S LESSON

'What have you eaten today?'

'Today? I don't know. I lunched a while ago.'

'What did you eat?' Casimir's voice took her up implacably.

'Some cherries and . . . and all sorts of things.'

In the end Marie was obliged to confess: since the evening before she had nibbled at a bundle of radishes and half a pound of cherries. She had worked until three that morning and had slept four hours. Then she had gone to the Sorbonne. On her return she had finished the radishes. Then she had fainted.

The doctor made no long speeches. He was furious—furious against Marie, whose ash-grey eyes looked at him with profound fatigue and innocent mirth, furious at himself, for he accused himself of not watching attentively enough over 'the little one' who had been confided to him by M. Sklodovski. Without listening to his sister-in-law's protests he handed her her hat and coat, and ordered her to take the books and papers she would need for the coming week. Then, silent, dissatisfied, unhappy, he carried her off to La Villette; from the threshold of the flat he hailed Bronya, who dashed for the kitchen.

Twenty minutes passed, and Marie swallowed, mouthful by mouthful, the medicines ordered for her by Casimir: an enormous underdone beefsteak and a plateful of crackling fried potatoes. As if by a miracle, the colour came back to her cheeks. On the same evening Bronya herself came at eleven o'clock to put the light out in the narrow room where she had set up a bed for her sister. For several days Marie, well fed and cared for, 'took the cure' and regained her strength. Then, obsessed by the approaching examinations, she returned to her attic, promising to be reasonable in the future.

And the next day she began again to live on air!

Work! . . . Work! Plunged altogether into

study, intoxicated by her progress, Marie felt herself equal to learning everything mankind had ever discovered. She attended courses in mathematics, physics and chemistry. Manual technique and the minute precision of scientific experiment became familiar to her, little by little; soon she was to have the joy of being charged by Professor Lippmann with researches of no great importance, which nevertheless permitted her to show her deftness and the originality of her mind. In the physics laboratory of the Sorbonne, Marie Sklodovska timidly tried her strength.

She had a passionate love for that atmosphere of attention and silence, the 'climate' of the laboratory, which she was to prefer to any other up to her last day. She was on her feet, always on her feet, in front of an oak table supporting precision instruments, or else in front of the chemical hood where some material bubbled away, worried at by the fierce blowpipe. She was hardly to be distinguished, in her big smock of wrinkled linen, from the thoughtful young men who bent beside her over other blowpipes and other instruments. Like them, she respected the concentration of the place. She made no noise, she pronounced no useless word.

One master's degree was not enough: Marie decided to obtain two; one in physics and one in mathematics. Her plans, once so humble, increased and grew richer so rapidly that she had not the time—and above all not the audacity—to confide them to M. Sklodovski, who, as she knew, impatiently awaited her return to Poland. As usual, the excellent man offered his help. But it could be felt that he was vaguely worried at having hatched this independent creature who had taken to flying with her own wings after so many years of submission and sacrifice.

Her brain was so precise, her intelligence so marvellously clear, that no disorder intruded to corrupt her effort. She was supported by a will of iron, by a maniacal taste

for perfection, and by an incredible stubbornness. Systematically, patiently, she attained each of the ends she had set for herself: she passed first in the master's examination in physics in 1893 and second in the master's in mathematics in 1894.

She had decided to learn the French language perfectly, as it was indispensable to her; and instead of cooing incorrect, sing-song sentences for years, as many Poles do, she learned her spelling and syntax with infallible sureness and hounded down the very last traces of her accent.

With her forty roubles a month she succeeded in living, and even, by depriving herself of the indispensable, achieved sometimes a certain amount of luxury: an evening at the theatre, a journey to the suburbs, whence she brought back flowers picked in the woods to glow for several days on her table. The little peasant of other days was not dead; lost in the great city, she lay in wait for the birth of the leaves, and as soon as she had a little time and money she hurried to the woods.

July: Fever, haste, agonizing trials, crushing mornings when, shut in with thirty students in the examination hall, Marie was so nervous that the letters danced before her eyes and she could not even read the fateful paper for several minutes, with its statement of the problem and the 'questions on the course'. When the composition was turned in, there came days of waiting until the solemn moment of publication of the results. Marie slipped in among the contestants and their families, crowded into the amphitheatre where the names of the elect would be read aloud, in order of merit. Pushed and shoved about as she was, she waited for the entrance of the examiner. And in a sudden silence she heard him pronounce first of all her own name: *Marie Sklodovska*.

Nobody was to guess her emotion. She tore herself away from the congratulations of her comrades, escaped

from the crowd and made off. The time for holidays had come now—for the departure to Poland and home.

In November she reappeared at the Sorbonne—cheerful and a bit too fat, having been stuffed with food for three months in all the houses of all the Sklodovskis in Poland, indignant as they were at her thinness. And again she faced a scholastic year in which she would work, learn, prepare for an examination, grow thin.

But each time autumn returned the same anxiety assailed Marie: how could she go back to Paris? Where was she to find money? Forty roubles at a time—her savings were being exhausted; and she thought with shame of the little pleasures her father deprived himself of to come to her help. In 1893 the situation seemed desperate and the girl was on the point of giving up the journey when a miracle took place. One of her friends arranged to have the Alexandrovitch Scholarship assigned to her—a scholarship for students of merit who wished to pursue their efforts abroad.

Six hundred roubles! Enough to live on for fifteen months! Marie, who knew so well how to ask favours for other people, would never have thought of soliciting this help, and above all could never have had the boldness to make the necessary approaches. Dazzled and enchanted, she took flight for France.

The Alexandrovitch Scholarship was providential. With great economy Marie tried to string out her six hundred roubles, so as to remain a little longer in the paradise of lecture halls and laboratories. Some years later, with the same great economy, she was to save six hundred roubles out of her first earnings—a technical study ordered from her by the Society for the Encouragement of National Industry—and was to take them to the secretary of the Alexandrovitch Foundation, stupified though he was at a restitution without precedent in the

annals of the committee. Marie had accepted this scholarship as testimony of confidence in her, a debt of honour. In her uncompromising soul she would have adjudged herself dishonest if she had kept for one unnecessary moment the money which now could serve as lifebuoy to another poor young girl.

Re-reading a little poem of my mother's, written in Polish, on this time of her life, and remembering the accounts of it that she sometimes gave me, with many a smile and humorous remark, looking at the only portrait of herself which she dearly cherished: the small photograph of a student girl with daring eyes and determined chin, I have felt that she never ceased to prefer these hard, fervent days to all others.

No doubt Marie knew other joys later. But even in her hours of infinite tenderness, even in the hour of triumph and fame, the eternal student was never so content with herself, so proud, as in the poverty and fire of this effort. She was proud of her poverty; proud of living alone and independent in a foreign city.

Yes, these four heroic years were not the happiest of Marie Curie's life, but the most perfect in her eyes, the nearest to those summits of the human mission toward which her gaze had been trained. An immense enthusiasm gave this girl of twenty-six the power to ignore the trials and privations she endured: to magnify her sordid existence into magic. Later on, love, maternity, the worries of a wife and mother, the complexities of crushingly hard work, were to restore the visionary to real life. But in the enchanted moment when she was poorer than she was ever to be again, she was as reckless as a child. She floated lightly in another world, that which her thought was to regard always as the only pure and true one.

Each day could not be altogether excellent in an adventure like this. There were unforeseen accidents which suddenly upset everything and seemed irremediable:

a fatigue impossible to surmount, a short illness requiring care. Still other, and terrifying catastrophes: the one pair of shoes, with leaky soles, gave out finally, and the purchase of new shoes became necessary. This meant a budget upside down for weeks, and the enormous expense had to be made up at all costs, on meals or on oil for the lamp.

Or else the winter was longer than usual and the sixth-floor garret was icy. It was so cold that Marie could no longer sleep; she shivered and chattered with it. Her supply of coal was exhausted. . . . But what of that? Could a Polish girl be conquered by a Parisian winter? Marie lighted her lamp again and looked about her. She opened the fat trunk and gathered together all the garments she possessed. She put on all she could, then, having slipped into bed, she piled the rest, her other dress, her linen, on top of the single coverlet. But it was still too cold. Marie stretched out her arm, pulled the one chair over to her, raised it and piled it, too, on top of the amassed garments, giving herself some sort of illusion of weight and heat.

All she had to do now was to wait for sleep, without moving, so as to preserve the scaffolding of which she was the living base. Meanwhile, a layer of ice was slowly forming in the water pitcher.

CHAPTER VII

PIERRE CURIE

MARIE had ruled love and marriage out of her life's programme. There was nothing extremely original in that. The student, exalted by intellectual ambitions, easily decided to renounce the things that make the servitude, happiness and unhappiness of other women, in order to follow her vocation.

Marie had built for herself a secret universe of implacable

rigour, dominated by the passion for science. Family affection and the attachment to an oppressed fatherland also had their place in it: but this was all. Nothing else counted, nothing else existed. Thus had she decreed, the beautiful creature of twenty-six who lived alone in Paris and met young men every day at the Sorbonne and in the laboratory.

A Pole, M. Kowalski,³¹ professor of physics in the University of Fribourg, was visiting Paris with his young wife, whom Marie had met at Szczuki. It was their honeymoon, but a scientific expedition as well. M. Kowalski gave some lectures in Paris, and attended the sessions of the Physics Society. On his arrival he had enquired after Marie and had asked her how she was. Marie had confided in him her worries of the moment: the Society for the Encouragement of National Industry had ordered a study from her on the magnetic properties of various steels. She had begun the researches in Professor Lippmann's laboratory; but she had to analyse minerals and group samples of metal, which required a cumbersome equipment—too cumbersome for the already crowded laboratory. And Marie did not know what to do, where to conduct her experiments.

'I have an idea', Joseph Kowalski said to her after some moments of reflection. 'I know a scientist of great merit who works in the School of Physics and Chemistry. Perhaps he might have a workroom available. In any case he could give you some advice. Come and have tea to-morrow evening, after dinner, with my wife and me. I will ask the young man to come. You probably know his name: it is Pierre Curie.'³²

In the course of the calm evening passed in the young couple's room in a quiet boarding-house, immediate sympathy brought the French physicist and the Polish student together.

Pierre Curie had a very individual charm made up of gravity and careless grace. He was tall. His clothes cut on ample, old-fashioned lines, hung a bit loosely about his body, but they became him: he had much natural elegance. His hands were long and sensitive. His regular, almost motionless face, lengthened by a rough beard, was made beautiful by his peaceful eyes, with their incomparable look, deep and serene, detached from all things.

The attraction he felt from the first moment for the foreign girl who spoke so little was doubled by intense curiosity. This Mlle Sklodovska was truly a rather astonishing person. . . . She was Polish, come from Warsaw to study at the Sorbonne, had passed first in the physics examination last year, would pass her mathematics examination in a few months. . . . And if between her ashen-grey eyes a little preoccupied wrinkle appeared, was it not because she didn't know where to install her apparatus for the study of magnetism in steel?

The conversation, at first general, was soon reduced to a scientific dialogue between Pierre Curie and Marie Sklodovska. Marie, with a shade of timidity and deference, asked questions and listened to Pierre's suggestions. He in turn explained his plans, and described the phenomena of crystallography which fascinated him and upon which he was now engaged in research. How strange it was, the physicist thought, to talk to a woman of the work one loves, using technical terms, complicated formulæ, and to see that woman, charming and young, become animated, understand, even discuss certain details with an infallible clear-sightedness.

. . . How sweet it was!

Who was Pierre Curie?

He was a French scientist of genius, very nearly unknown in his own country, but already highly esteemed by his foreign colleagues. •

He and his brother Jacques³⁵ were drawn by science from their infancy. Pierre, with his independent and dreamy mind, was unable to adapt himself to systematic work and discipline. He had never been to school. His father, Dr. Curie, understanding that the boy was too original to be a brilliant pupil, had at first instructed him himself, and afterward had confided him to a remarkable teacher, M. Bazille. This liberal education had borne fruit: Pierre Curie was a Bachelor of Science at sixteen and had a master's degree in physics at eighteen. At nineteen he was appointed laboratory assistant to Professor Desains in the Faculty of Science—a position he occupied for five years. He was engaged in research with his brother Jacques, who also had his degree and was a laboratory worker at the Sorbonne. The two young physicists soon announced the discovery of the important phenomenon of 'piezoelectricity', and their experimental work led them to invent a new apparatus with many practical uses: *piezoelectric* quartz, which measures small quantities of electricity with precision.

In 1883 the two brothers separated with regret: Jacques was appointed professor at Montpellier, and Pierre became chief of laboratory at the School of Physics and Chemistry of the City of Paris. Even though he devoted much time to demonstrations for the pupils, he pursued his theoretical work on crystalline physics. This work led to the formulation of the principle of symmetry, which was to become one of the bases of modern science.

Taking up his experimental study again, Pierre Curie invented and built an ultra-sensitive scientific scale, the 'Curie scale'. Then he undertook research on magnetism and obtained a result of capital importance: the discovery of a fundamental law: 'Curie's law.'

For these efforts, crowned by dazzling success, and for the constant care he lavished on the thirty students confided to him, Pierre Curie was receiving from the

French State, in 1894, after fifteen years of work, a salary of three hundred francs a month—just about what a specialized worker would receive in a factory.

Pierre Curie had been immediately captivated by Marie Sklodovska and had understood what was unique in her. With gentle tenacity he endeavoured to get on friendly terms with the girl. He saw her again two or three times at the sessions of the Physics Society, where she was listening to the reports of scientists on new research. He sent her, by way of compliment, a reprint of his latest publication, *On Symmetry in Physical Phenomena: Symmetry of an Electric Field and of a Magnetic Field*; and on the first page he wrote in his awkward hand: 'To Mlle Sklodovska, with the respect and friendship of the author, P. Curie.' He had seen her in Lippmann's laboratory, in her big linen smock, bent silently over her apparatus.

One day they were having tea together in Marie's room. The physicist had just been speaking at length about a piece of work that preoccupied him. Then, without transition:

'I wish you would come to know my parents. I live with them, in a little house at Sceaux.³⁴ They are charming.'

He described his father for her: a tall, ungainly old man with lively blue eyes, very intelligent, hasty and impetuous, apt to boil over like a quick soup, but extremely kind—and his mother, weighed down by infirmities, but still an expert housekeeper, brave, gay and courageous. He recalled his fantastic childhood, his interminable jaunts in the woods with his brother Jacques. . . .

Marie listened with surprise. What mysterious likenesses and coincidences! By changing a few details, transporting the little house at Sceaux to a street in Warsaw, you could turn the Curies into the Sklodovski family.

Smiling and more at her ease, Marie told the tale of her merry holidays in the Polish countryside—that countryside which she was going to see again in a few weeks.

‘But you’re coming back in October? Promise me that you will come back! If you stay in Poland you can’t possibly continue your studies. You have no right to abandon science now. . . .’

These commonplace words of solicitude betrayed profound anxiety. And Marie felt that when Pierre said: ‘You have no right to abandon science,’ he meant, above all, ‘You have no right to abandon me.’

They were silent for a time. Then Marie, lifting her ash-grey eyes to Pierre, answered gently, in a voice that still hesitated: ‘I believe you are right. I should like to come back—very much.’

Pierre spoke of the future several times again. He had asked Marie to be his wife; but the answer was not a happy one. To marry a Frenchman and leave her family for ever, to renounce all political activity and abandon Poland, seemed to Mlle Sklodovska like so many dreadful acts of betrayal. She could not and must not. She had passed her examination brilliantly; and now she must go back to Warsaw for the summer at least, perhaps for ever. She offered the discouraged young scientist a friendship which was no longer enough for him, and took her train, having promised nothing.

He followed her in thought; he would like to join her in Switzerland, where she was passing a few weeks with her father who had come to meet her; or else in Poland—in that Poland of which he was jealous. But it could not be. . . .

October came. Pierre’s heart swelled with happiness: Marie, according to her promise, had returned to Paris. She was to be seen again at the lectures in the Sorbonne and at Lippmann’s laboratory. But this year—her last

in France, as she believed—she no longer lived in the Latin Quarter. Bronya had given her a room adjoining the surgery she had opened for consultation at 37 Rue de Châteaudun. As the Dluskis still lived in La Villette and Bronya came to the Rue de Châteaudun only during the day, Marie could thus work in peace.

It was in this dark and rather dismal lodging that Pierre Curie resumed his tender entreaties.

Ten more months had to pass before the obdurate Pole accepted the idea of marriage. On 26 July Marie awoke for the last time in her lodging in the Rue de Châteaudun. It was a marvellous day. The girl's face was beautiful. Something her student comrades had never seen was alight in her face: to-day Mlle Sklodovska was to become Mme Pierre Curie.

She dressed her lovely hair and put on her wedding dress, a present from Casimir Dluski's aged mother, who now lived in the Rue d'Allemagne. 'I have no dress except the one I wear every day,' Marie had said. 'If you are going to be kind enough to give me one, please let it be practical and dark, so that I can put it on afterwards to go to the laboratory.'

Marie loved the idea of her wedding, which was to be, in every detail of the great day, different from all other weddings. There would be no white dress, no gold ring, no 'wedding breakfast'. There would be no religious ceremony: Pierre was a freethinker and Marie, for a long time past, had ceased the practices of religion. There were no lawyers necessary, as the marriage pair possessed nothing in the world—nothing but two glittering bicycles, bought the day before with money sent as a present from a cousin, with which they were going to roam the countryside in the coming summer.

It was to be a wonderful wedding indeed, for neither indifference, curiosity, nor envy was to be present. At the city hall in Sceaux and in the little garden at Pierre's

parents' house in the Rue des Sablons there would be Bronya and Casimir, a few very close friends—university people—and Professor Sklodovski, who had come from Warsaw with Hela. . . . The professor made it a point of honour to talk to old Dr. Curie in the most correct and careful French ; but first of all he would say, in his lowest tone, very moved, these words straight from his good heart : ' You will have a daughter worthy of affection in Marie. Since she came into the world she has never caused me pain.'

CHAPTER VIII

A YOUNG COUPLE

MARIE always succeeded in her undertakings. It was thus with her marriage. She had hesitated for more than a year before marrying Pierre Curie. Now that she was his wife, she organized their conjugal life with such far-sighted tenderness that she was to make a wonderful thing of it.

The first days of their life together were picturesque : Pierre and Marie roamed the roads on their famous bicycles. In the baggage straps they strung up a few clothes and two long rubberized cloaks which the rainy summer had forced them to buy. They lunched on bread and cheese, peaches and cherries, seated on the moss of some woodland glade. In the evening, they stopped by chance at some unknown inn. There they found thick, hot soup and a room with faded wallpaper on which the candle made shadows dance.

Since his childhood Pierre had had the habit of going off when he liked, sometimes at dawn, sometimes at dusk, without knowing whether he would come back in three days or in an hour.

While they cycled Pierre went on thinking aloud about the work on crystals that preoccupied him, without even turning round to catch his wife's eyes. He knew that Marie understood, and that what she would reply would be intelligent, useful and original. She, too, had great plans for the next university year: she was going to prepare for the Fellowship competition, and it was almost certain that the director of the School of Physics would authorize her to make her researches in the same laboratory with Pierre. Thus they could live constantly together, never separate.

Towards the middle of August, delighted and tired by their wonderful summer, the young couple settled down near Chantilly on a farm called The Hind. This, too, was one of Bronya's discoveries: she had taken the peaceful dwelling for several months. There Marie and Pierre rejoined old Mme Dluska, Casimir, Bronya and their daughter Helen, nicknamed 'Lou', Professor Sklodovski and Hela, who had prolonged their stay in France.

The little flat at 24 Rue de la Glacière, where the young couple settled in October, had windows giving on a big garden. This lodging, which was singularly lacking in comfort, possessed no other charm.

Marie and Pierre had done nothing to decorate their three tiny rooms. They even refused the furniture offered them by Dr. Curie: every sofa and chair would be one more object to dust in the morning. Marie could not do it; she hadn't time. In any case, what was the good of a sofa or chair, as the Curies had agreed to do away with meetings and calls? The troublesome person who risked his neck on the four flights of stairs in order to disturb the young couple in their lair was rebuffed once for all when he got into the conjugal office with its bare walls furnished with books and a white wooden table. At one end of the table was Marie's chair; at the other, Pierre's. On the table were treatises on physics, a petroleum lamp,

a bunch of flowers ; and that was all. Before these two chairs, neither of which was for him, and before the politely astonished gaze of Pierre and Marie, the most daring visitor could only flee.

Pierre's existence tended toward one ideal only : to engage in scientific research at the side of the beloved woman who also lived for scientific research. Marie's was a harder life, because to the obsession of work was added the humble and tiring tasks of womankind. She could no longer neglect material life, as she had done in the austere and careless days of her study at the Sorbonne ; and her first purchase on their return from holiday was a black account book with the great word EXPENSES printed in letters of gold on its cover.

Pierre Curie now earned five hundred francs a month at the School of Physics. These five hundred francs were the couple's only resource until Marie's diploma as fellow of the university would permit her to teach in France.

This would do well enough : with such a sum a modest pair could live, and Marie knew how to be economical. The difficult thing was to get the crushing work of one day into twenty-four hours. Marie passed the whole morning and afternoon at the laboratory of the school, where a place had been found for her. The laboratory was happiness ; and yet there were a floor to sweep and a bed to make at the Rue de la Glacière. Pierre's clothes had to be kept in good condition and his meals had to be suitable. With no maid.

So Marie got up early to go to market ; and in the evenings as she was coming home from school on Pierre's arm she took him into the grocer's shop or the dairy. She peeled the vegetables for the noonday meal in the morning before she went to the laboratory. Where were the days when the careless Mlle Sklodovska didn't know the strange ingredients of soup ? Mme Pierre Curie made it a point of honour to learn them. As soon as her marriage

had been decided, the student had gone secretly to ask for cookery lessons from old Mme Dluski and Bronya. She practised cooking a chicken and fried potatoes, and dutifully prepared wholesome meals for Pierre, who was indulgence itself, and so absent-minded that he never even noticed the great effort she made.

Marie was stimulated by a puerile conceit; what a mortification it would be for her if her French mother-in-law, face to face some day with an unsuccessful omelette, wondered aloud what on earth they taught the young girls in Warsaw! Marie read and re-read her cookery book and annotated it conscientiously in the margins, reporting her trials, failures and successes in brief phrases of scientific accuracy.

She invented dishes which needed little preparation, and still others which could be left to 'cook themselves' during the hours she passed at the school. But cooking was as difficult and mysterious as chemistry. What could she do to keep the macaroni from sticking? Should she put boiled beef into cold or hot water? How long should runner beans boil? In front of her oven Marie, her cheeks afire, heaved many a sigh. It had been so simple in the old days to live on buttered bread and tea, radishes and cherries!

Little by little she improved in housekeeping wisdom. The gas heater, which on several occasions had taken the liberty of burning the roast, now knew its duty. Before going out, Marie would regulate the flame with a physicist's precision; then, casting one last worried glance at the few pans she was entrusting to the fire, she shut the door on the landing, flew down the stairs and caught up with her husband, to walk with him toward the school.

In a quarter of an hour, bent over the other containers, she would regulate the height of flame on a laboratory burner with the same careful gesture.

Eight hours of scientific research and two or three hours

of housekeeping were not enough. In the evening, after writing down the details of daily expenses in the account-book columns so pompously headed 'Monsieur's Expenditure' and 'Madame's Expenditure', Marie Curie sat down at one end of the white wood table and became absorbed in preparing for the Fellowship competition. On the other side of the lamp Pierre was drawing up the programme of his new course at the School of Physics. There was a light at the window of their room until two or three in the morning, and the sound of the turning page, the running pen, could be heard in their office with its two chairs.

In the examination for a Fellowship in Secondary Education Mme Curie passed first. Pierre, without a word, flung his proud, protecting arm around Marie's neck. They went to the Rue de la Glacière arm in arm; and as soon as they got there they blew up the tyres of their bicycles and packed their bags. They were off to Auvergne on a journey of exploration.

The second year of their marriage differed from the first only in Marie's state of health, which was upset by her pregnancy. Mme Curie had wanted a child, but she was vexed at being so ill and at being unable to stand before the apparatus and study the magnetization of steel.

Very soon after the birth of her daughter, Irène, she started work at the laboratory and finished and edited her work on magnetization for the bulletin of the Society for Encouragement of National Industry.

Thus, in the same year, within an interval of three months Marie Curie brought into the world her first child and the results of her first research.

Sometimes her acrobatic system of life seemed impossible to continue. Her health had deteriorated since her pregnancy. The doctors feared that she might get

tuberculosis like her mother, who had died of it, and advised her to go to a sanatorium. But the stubborn scientist listened to them absent-mindedly and flatly refused to obey.

She had other things to worry about. She had the laboratory, her husband, her home and her daughter. Little Irène's tears as she was cutting teeth ; a cold in the head ; any minor accident troubled the calm of the household and made the two scientists pass nights of sleepless anxiety. Or else Marie, panic-stricken, would suddenly fly from the School of Physics toward the Parc Montsouris : had the nurse lost the child ? No ; she could see afar off, on their accustomed round, the woman and the little carriage in which something white could be discerned.

The Polish girl had travelled far since the morning in November 1891 when she had arrived, laden with parcels, in a third-class carriage. Manya Skłodovska had discovered physics, chemistry and the whole life of a woman. She had conquered humble and gigantic obstacles without for a moment suspecting that to do so she had called upon unequalled tenacity and exceptional courage.

These struggles and victories had transformed her physically ; they had given her a new face. It is impossible to look unmoved at a photograph of Marie Curie taken a little after her thirtieth year. The solid and rather thick-set girl had become an ethereal creature. One would like to say : ' What an attractive, odd and pretty woman ! '—but one does not dare, in front of the immense brow, of that gaze into another world.

Mme Curie had a tryst with fame. She had made herself beautiful.

CHAPTER IX

THE DISCOVERY OF RADIUM

At the end of 1897 the balance-sheet of Marie's activity showed two university degrees, a fellowship and a monograph on the magnetization of tempered steel. No sooner had she recovered from childbirth than she was back again at the laboratory.

The next stage in the logical development of her career was the doctor's degree. Several weeks of indecision came in here. She had to choose a subject of research which would furnish fertile and original material.

At this critical moment Pierre's advice had an importance which cannot be neglected. But without a doubt Marie's character, her intimate nature, played a great part in this all-important choice. From childhood the Polish girl had carried the curiosity and daring of an explorer within her. This was the instinct that had driven her to leave Warsaw for Paris and the Sorbonne, and had made her prefer a solitary room in the Latin Quarter to the Dluskis' comfortable home. In her walks in the woods she always chose the wild trail or the unfrequented road.

Marie, going through the reports of the latest experimental studies, was attracted by the publication of the French scientist Henri Becquerel³⁵ of the preceding year. She and Pierre already knew this work; she read it over again and studied it with her usual care.

After Röntgen's³⁶ discovery of X-rays, Henri Poincaré³⁷ conceived the idea of determining whether rays like the X-rays were emitted by fluorescent bodies under the action of light. Attracted by the same problem, Henri

Becquerel examined the salts of a rare metal, uranium. Instead of the phenomenon he had expected, he observed another, altogether different and incomprehensible: he discovered that uranium salts *spontaneously* emitted, without exposure to light, some rays of unknown nature. A compound of uranium, placed on a photographic plate surrounded by black paper, made an impression on the plate through the paper. And, like the X-ray, these astonishing uranic salts discharged an electroscope by rendering the surrounding air a conductor.

Henri Becquerel made sure that these surprising properties were not caused by a preliminary exposure to the sun and that they persisted when the uranium compound had been maintained in darkness for several months. For the first time, a physicist had observed the phenomenon to which Marie Curie was later to give the name of *radioactivity*. But the nature of the radiation and its origin remained a mystery.

Becquerel's discovery fascinated the Curies. They asked themselves whence came the energy—tiny, to be sure—which uranium compounds constantly disengaged in the form of radiation. And what was the nature of this radiation? Here was an engrossing subject of research, a doctor's thesis! The subject tempted Marie most because it was a new field: Becquerel's work was very recent and so far as she knew nobody in the laboratories of Europe had yet attempted to make a fundamental study of uranium rays. It was a leap into great adventure into an unknown realm.

There remained the question of where she was to make her experiments—and here the difficulties began. Pierre made several approaches to the director of the School of Physics with practically no results: Marie was given the free use of a little glassed-in studio on the ground floor of the school. It was a kind of store-room, sweating with damp, where unused machines and lumber were put away.

Its technical equipment was rudimentary and its comfort *nil*.

Deprived of an adequate electrical installation and of everything that forms material for the beginning of scientific research, she kept her patience, sought and found a means of making her apparatus work in this hole.

It was not easy. Instruments of precision have sneaking enemies: humidity, changes of temperature. Incidentally the climate of this little workroom, fatal to the sensitive electrometer, was not much better for Marie's health. But this had no importance. When she was cold, the young woman took her revenge by noting the degrees of temperature in her notebook. On 6 February, 1898, we find among the formulas and figures: 'Temperature here 44° . . . !' Marie to show her disapproval, added ten little exclamation points.

The candidate for the doctor's degree set her first task to be the measurement of the 'power of ionization' of uranium rays—that is to say, their power to render the air a conductor of electricity and so to discharge an electroscope. The excellent method she used, which was to be the key to the success of her experiments, had been invented for the study of other phenomena by two physicists well-known to her: Pierre and Jacques Curie. Her technical installation consisted of an ionization chamber, a Curie electrometer and a piezoelectric quartz.

At the end of several weeks the first result appeared: Marie acquired the certainty that the intensity of this surprising radiation was proportional to the quantity of uranium contained in the samples under examination, and that this radiation, which could be measured with precision, was not affected either by the chemical state of combination of the uranium or by external factors such as lighting or temperature.

The more Marie penetrated into intimacy with uranium rays, the more they seemed without precedent, essentially

unknown. They were like nothing else. Nothing affected them. In spite of their very feeble power, they had an extraordinary individuality.

Turning this mystery over and over in her head, and pointing toward the truth, Marie felt, and could soon affirm, that the incomprehensible radiation was an *atomic* property. She questioned: even though the phenomenon had only been observed with uranium, nothing proved that uranium was the only chemical element capable of emitting such radiation. Why should not other bodies possess the same power? Perhaps it was only by chance that this radiation had been observed in uranium first, and had remained attached to uranium in the minds of physicists. Now it must be sought for elsewhere. . . .

No sooner said than done. Abandoning the study of uranium, Marie undertook to examine *all known chemical bodies*, either in the pure state or in compounds. The result was not long in appearing: compounds of another element, thorium, also emitted spontaneous rays like those of uranium and of similar intensity. The physicist had been right: the surprising phenomenon was by no means the property of uranium alone, and it became necessary to give it a distinct name. Mme Curie suggested the name of *radioactivity*. Chemical substances like uranium and thorium, endowed with this particular 'radiance', were called *radio elements*.

Radioactivity so fascinated the young scientist that she never tired of examining the most diverse forms of matter, always by the same method. Instead of limiting her observation to simple compounds, salts and oxides, she wanted to assemble samples of minerals from the collection at the School of Physics and make them undergo, almost casually, for her own information, a kind of customs inspection, which is an electrometer test.

Marie's idea was simple—simple as the stroke of genius. At the cross-roads where Marie now stood,

hundreds of research workers might have remained, nonplussed, for months or even years. After examining all known chemical substances, and discovering—as Marie had done—the radiation of thorium, they would have continued to ask themselves in vain whence came this mysterious radioactivity. Marie, too, questioned and wondered. But her surprise was translated into fruitful acts. She had used up all evident possibilities. Now she turned towards the unplumbed and the unknown.

She knew in advance what she would learn from an examination of the minerals, or rather she thought she knew. The specimens which contained neither uranium nor thorium would be revealed as totally 'inactive'. The others, containing uranium or thorium, would be radioactive.

Experiment confirmed this prevision. Rejecting the inactive minerals, Marie applied herself to the others and measured their radioactivity. Then came a dramatic revelation: the radioactivity was a *great deal stronger* than could have been normally foreseen by the quantity of uranium or thorium contained in the products examined!

'It must be an error in experiment,' the young woman thought; for doubt is the scientist's first response to an unexpected phenomenon.

She started her measurements over again, unmoved, using the same products—repeated them ten times, twenty times; and she was forced to yield to the evidence: the quantities of uranium and thorium found in these minerals were by no means sufficient to justify the exceptional intensity of the radiation she observed.

Where did this excessive and abnormal radiation come from? Only one explanation was possible: the minerals must contain, in small quantity, a *much more powerfully* radioactive substance than uranium and thorium.

But what substance? In her preceding experiments.

Marie had already examined *all known chemical elements*.

The scientist replied to the question with the sure logic and the magnificent audaciousness of a great mind. The minerals certainly contained a radioactive substance which was at the same time a chemical element until then unknown : *a new element*.

A new element ! It was a fascinating and alluring hypothesis—but still a hypothesis. For the moment this powerfully radioactive substance existed only in the imagination of Marie and of Pierre. But it did exist there. It existed strongly enough to make the young woman go to see Bronya one day and tell her in a restrained, ardent voice :

‘ You know, Bronya, the radiation that I couldn’t explain comes from a new chemical element. The element is there and I’ve got to find it. We are sure ! The physicists we have spoken to believe we have made an error in experiment and advise us to be careful. But I am convinced that I am not mistaken.’

These were unique moments in her unique life. The layman forms a theatrical—and wholly false—idea of the research worker and of his discoveries. ‘ The moment of discovery ’ does not always exist : the scientist’s work is too tenuous, too divided, for the certainty of success to crackle out suddenly in the midst of his laborious toil like a flash of lightning, dazzling him by its fire. Marie, standing in front of her apparatus, perhaps never experienced the sudden intoxication of triumph. This intoxication was spread over several days of decisive labour, made feverish by a magnificent hope. But it must have been an exultant moment when, convinced by the rigorous reasoning of her brain that she was on the trail of new matter, she confided the secret to her elder sister, her ally always. . . . Without exchanging one affectionate word, the two sisters must have lived

again, in a dizzy breath of memory, their years of waiting, their mutual sacrifices, their bleak lives as students, full of hope and faith.

It was barely four years earlier that Marie had written :
' Life is not easy for any of us. But what of that ?
We must have perseverance and, above all, confidence in ourselves. We must believe that we are gifted for something, and that this thing, at whatever cost, must be attained.'

That ' something ' was to direct science towards a path hitherto unsuspected.

In a first communication to the Academy, presented by Professor Lippmann and published in the *Proceedings* on 12 April, 1898, ' Marie Sklodovska Curie ' announced the probable presence in pitch-blende ores of a new element endowed with powerful radioactivity. This was the first stage of the discovery of radium.

By the force of her own intuition the physicist had shown to herself that the wonderful substance must exist. She decreed its existence. But its incognito still had to be broken. Now she would have to verify hypothesis by experiment, isolate this material and see it. She must be able to announce with certainty : ' It is there.'

Pierre Curie had followed the rapid progress of his wife's experiments with passionate interest. Without directly taking part in Marie's work, he had frequently helped her by his remarks and advice. In view of the stupefying character of her results, he did not hesitate to abandon his study of crystals for the time being in order to join his efforts to hers in the search for the new substance.

The available force was now doubled. Two brains, four hands, now sought the unknown element in the damp little workroom in the Rue Lhomond. From this moment onward it is impossible to distinguish each one's part in the work of the Curies.

Marie and Pierre looked for the mysterious substance

in an ore of uranium called pitch-blende, which in the crude state had shown itself to be four times more radioactive than the pure oxide of uranium that could be extracted from it. But the composition of this ore had been known for a long time with considerable precision. The new element must therefore be present in very small quantity or it would not have escaped the notice of scientists and their chemical analysis.

According to their calculations—'pessimistic' calculations like those of true physicists, who always take the less attractive of two probabilities—the collaborators thought the ore should contain the new element to a maximum quantity of one per cent. They decided that this was very little. They would have been in consternation if they had known that the radioactive element they were hunting down did not count for more than a millionth part of pitch-blende ore.

They began their prospecting patiently, using a method of chemical research invented by themselves, based on radioactivity: they separated all the elements in pitch-blende by ordinary chemical analysis and then measured the radioactivity of each of the bodies thus obtained. By successive eliminations they saw the 'abnormal' radioactivity take refuge in certain parts of the ore. As they went on, the field of investigation was narrowed. It was exactly the technique used by the police when they search the houses of a neighbourhood, one by one, to isolate and arrest a malefactor.

But there was more than one malefactor here: the radioactivity was concentrated principally in two different chemical fractions of the pitch-blende. For M. and Mme Curie it indicated the existence of two new elements instead of one. By July, 1898 they were able to announce the discovery of one of these substances with certainty.

'You will have to name it,' Pierre said to his young

wife, in the same tone as if it were a question of choosing a name for little Irène.

The one-time Mlle Sklodovska reflected in silence for a moment. Then, her heart turning toward her own country which had been erased from the map of the world, she wondered vaguely if the scientific event would be published in Russia, Germany and Austria—the oppressor countries—and answered timidly :

‘ Could we call it “ polonium ” ? ’

In December, 1898, soon after the discovery of polonium, Marie and Pierre reported to the Academy of Science the existence of a second new chemical element in pitch-blende.

Some lines of this communication read as follows :

The various reasons we have just enumerated lead us to believe that the new radioactive substance contains a new element to which we propose to give the name of RADIUM.

The new radioactive substance certainly contains a very strong proportion of barium ; in spite of that its radioactivity is considerable. The radioactivity of radium, therefore, must be enormous.

CHAPTER X

FOUR YEARS IN A SHED

THE physicist colleagues of the Curies received the news of the discovery of radium rather doubtfully. The special properties of polonium and radium upset fundamental theories in which scientists had believed for centuries. How was one to explain the spontaneous radiation of the radioactive bodies ? The discovery upset a world of acquired knowledge and contradicted the most firmly established ideas on the composition of matter. Thus the

physicist kept on the reserve. He was violently interested in Pierre and Marie's work, he could perceive its infinite developments, but before being convinced he awaited decisive results.

The attitude of the chemist was even more downright. By definition, a chemist only believes in the existence of a new substance when he has seen the substance, touched it, weighed and examined it, tested it with acids, bottled it, and when he has determined its 'atomic weight'.

Now, up to the present, nobody had *seen* radium, nobody knew its atomic weight. The chemists, faithful to their principles, therefore concluded: 'No atomic weight, no radium. Show us some radium and we will believe you.'

To show polonium and radium to the incredulous, to prove to the world the existence of their 'children', and to complete their own conviction, M. and Mme Curie were now to labour for four years.

The aim was to obtain pure radium and polonium. In the most strongly radioactive products which the scientists had prepared, these substances figured only in imperceptible traces. Pierre and Marie already knew the method by which they could hope to isolate the new metals, but the separation could not be made except by treating very large quantities of crude material.

Here arose three agonizing questions:

How were they to get a sufficient quantity of ore?
What premises could they use to effect their treatment?
What money was there to meet the inevitable cost of the work?

Pitch-blende, in which polonium and radium were hidden, was a costly ore, treated at the St. Joachimsthal³⁸ mines in Bohemia for the extraction of uranium salts used in the manufacture of glass. Tons of pitch-blende would cost a great deal: far too much for the Curie household.

Ingenuity was to make up for wealth. According to expectation of the two scientists, the extraction of uranium should leave, intact in the ore, such traces of polonium and radium as the ore contains. There was no reason why these traces should not be found in the residue. And whereas crude pitch-blende was costly, its residue after treatment had very slight value.

Would it not be possible to obtain a considerable quantity of such residue for a reasonable price?

It was simple enough: but somebody had to think of it.

It was necessary, of course, to buy this crude material and pay for its transportation to Paris. Pierre and Marie appropriated the required sum from their meagre savings. They were not so foolish as to ask for official credits. . . . If two physicists on the scent of an immense discovery had asked the University of Paris or the French government for a grant to buy pitch-blende residue they would have been laughed at.

But at least could there not be found, in the numerous buildings attached to the Sorbonne, some kind of suitable workroom to lend to the Curie couple? Apparently not. After vain attempts, Pierre and Marie staggered back to their point of departure, which is to say to the School of Physics where Pierre taught, to the little room where Marie had done her first experiments. The room gave on a courtyard, on the other side of which was a wooden shack, an abandoned shed, with a skylight roof in such bad condition that it admitted the rain. The Faculty of Medicine had formerly used the place as a dissecting room, but for a long time now it had not even been considered fit for a mortuary. There was no floor and an uncertain layer of bitumen covered the earth. It was furnished with some worn kitchen tables, a blackboard which had landed there for no known reason, and an old cast-iron stove with a rusty pipe.

A workman would not willingly have worked in such

a place : Marie and Pierre, nevertheless, resigned themselves to it. As they were taking possession of the shed, a reply arrived from Austria. Good news ! By extraordinary luck, the residue of recent extractions of uranium had not been scattered. The Austrian government, which was the proprietor of the State factory there, decided to present a ton of residue to the two French 'lunatics' who thought they needed it. If, later on, they wanted a greater quantity of the material, they could obtain it at the mine on the best terms. For the moment the Curies had to pay only the transportation charges on a ton of ore.

One morning a heavy wagon, like those which deliver coal, drew up in the Rue Lhomond before the School of Physics. Pierre and Marie were notified. They hurried bareheaded into the street in their laboratory gowns. Pierre, who was never excited, remained calm ; but the more exuberant Marie could not restrain her joy at the sight of the sacks that were being unloaded. It was pitch-blende, *her* pitch-blende, for which she had received a notice some days before from the freight station. Full of curiosity and impatience, she wanted to open one of the sacks and contemplate her treasure without further waiting. She cut the strings, undid the coarse sackcloth and plunged her two hands into the dull brown ore, still mixed with pine-needles from Bohemia.

That was where radium was hidden. It was from there that Marie must extract it, even if she had to treat a mountain of this inert stuff like dust on the road.

Marya Sklodovska had lived through the most intoxicating moments of her student life in a garret ; Marie Curie was to know wonderful joys again in a dilapidated shed. It was a strange sort of beginning over again, in which a sharp subtle happiness (which probably no woman before Marie had ever experienced) twice elected the most miserable setting.

The shed in the Rue Lhomond surpassed the most pessimistic expectations of discomfort. In summer, because of its skylights, it was stifling as a hothouse; in winter one did not know whether to wish for rain or frost; if it rained the water fell, drop by drop, with a soft, nerve-racking noise, on the ground or on the work-tables, in places which the physicists had to mark in order to avoid putting apparatus there; if it froze, one froze. There was nothing to do about it. The stove, even when it was stoked high, was a complete disappointment. If one went near enough to touch it one received a little heat, but two steps away and one was back in the zone of ice.

It was almost better for Marie and Pierre to get used to the cruelty of the outside temperature, since their technical installation—hardly existent—possessed no chimneys to carry off noxious gases, and the greater part of their treatment had to be made in the open air, in the courtyard. When a shower of rain came the physicists hastily moved their apparatus inside: to keep on working without being suffocated they set up draughts between the opened door and windows.

In such conditions M. and Mme Curie worked for four years from 1898 to 1902.

During the first year they busied themselves with the chemical separation of radium and polonium and they studied the radiation of the products (more and more active) thus obtained. Before long they considered it more practical to separate their efforts. Pierre Curie tried to determine the properties of radium, and to know the new metal better; Marie continued those chemical treatments which would permit her to obtain salts of pure radium.

In this division of labour Marie had chosen the 'man's job'. She accomplished the toil of a day labourer. Inside the shed her husband was absorbed by delicate experiments. In the courtyard, dressed in her old

dust-covered and acid-stained smock, surrounded by smoke which stung her eyes and throat, Marie was a sort of factory all by herself.

Radium showed no intention of allowing itself to be known by human creatures. Where were the days when Marie naïvely expected the radium content of pitchblende to be *one per cent*? The radiation of the new substance was so powerful that a tiny quantity of radium, disseminated through the ore, was the source of striking phenomena which could be easily observed and measured. The difficult, the impossible thing was to isolate this minute quantity, to separate it from the rest in which it was so intimately mixed.

Whenever Pierre and Marie, left their apparatus for a moment and quietly let their tongues run on, their talk about their beloved radium passed from the transcendent to the childish.

'I wonder what *It* will be like, what *It* will look like,' Marie said one day. 'Pierre, what form do you imagine *It* will take?'

'I don't know,' the physicist answered gently. 'I should like it to have a very beautiful colour . . .'

In the course of the years 1899 and 1900 Pierre and Marie Curie published a report on the discovery of 'induced radioactivity' due to radium, another on the effects of radioactivity, and another on the electric charge carried by the rays. And at last they drew up, for the Congress of Physics of 1900, a general report on the radioactive substances, which aroused immense interest among the scientists of Europe.

The development of the new science of radioactivity was rapid, overwhelming—the Curies needed fellow-workers.

Toward 1900, Pierre Curie entered into relations with a young chemist, André Debierne,³⁹ who esteemed him highly. André Debierne willingly accepted work on radioactivity. He undertook especially the research

of a new radio element, the existence of which was suspected in the group of iron and rare clays.

Thus, even before radium and polonium were isolated, a French scientist, André Debierne, had discovered a 'brother', *actinium*.

Marie continued to treat, pound by pound, the tons of pitch-blende residue which were sent her on several occasions from St. Joachimsthal. With her remarkable patience she was able to be, every day for four years, physicist, chemist, specialized worker, engineer and labouring man all at once. Thanks to her brain and muscle, the old tables in the shed held more and more concentrated products—products richer and richer in radium. Mme Curie was approaching the end: she no longer stood in the courtyard, enveloped in bitter smoke, to watch the heavy basins of material in fusion. She was now at the stage of purification and of the 'fractional crystallization' of strongly radioactive solutions. But the poverty of her haphazard equipment hindered her work more than ever. It was now that she needed a spotlessly clean workroom and apparatus perfectly protected against cold, heat and dirt. In this shed, open to every wind, iron- and coal-dust was afloat which, to Marie's despair, became mixed with the products purified with so much care. Her heart sometimes constricted before these little daily accidents, which absorbed so much of her time and her strength.

Pierre was so tired of the interminable struggle that he would have been quite ready to abandon it. Of course he did not dream of dropping the study of radium and of radioactivity. But he would willingly have renounced, for the time being, the special operation of preparing pure radium. The obstacles seemed insurmountable. Could they not resume this work later on, under better conditions? More attached to the meaning of natural

phenomena than to their material reality, Pierre Curie was exasperated to see the paltry results to which Marie's exhausting effort had led. He advised an armistice.

He counted without his wife's character. Marie wanted to isolate radium and she *would* isolate it. She scorned fatigue and difficulties, and even the gaps in her own knowledge which complicated her task. After all, she was only a very young scientist: she still had not the certainty and great culture Pierre had acquired by twenty years' work, and sometimes she stumbled across phenomena or methods of calculation of which she knew very little and for which she had to make hasty studies.

So much the worse! With stubborn eyes under her great brow, she clung to her apparatus and her test-tubes.

In 1902, forty-five months after the day on which the Curies announced the probable existence of radium, Marie finally carried off the victory in this war of attrition: she succeeded in preparing a decigramme⁴⁰ of pure radium, and made a first determination of the atomic weight of the new substance, which was 225.

The incredulous chemists—of whom there were still a few—could only bow before the facts, before the super-human obstinacy of a woman.

Radium officially existed.

It was nine o'clock at night. Pierre and Marie Curie were in their little house at 108 Boulevard Kellermann, where they had been living since 1900.

Pierre walked slowly about the room. Marie sat down and made some stitches on the hem of Irène's new apron.

But this evening she could not fix her attention. Nervous, she got up; then, suddenly:

'Suppose we go down there for a moment?'

The day's work had been hard, and it would have been more reasonable for the couple to rest. But Pierre and Marie were not always reasonable.

As they arrived and opened the door of the shed, Marie said :

' Do you remember the day when you said to me : " I should like radium to have a beautiful colour " ? '

The reality was more entrancing than the simple wish of long ago. Radium had something better than ' a beautiful colour ', it was spontaneously luminous. And in the sombre shed, where, in the absence of cupboards, the precious particles in their tiny glass receivers were placed on tables or on shelves nailed to the wall, their phosphorescent bluish outlines gleamed, suspended in the night.

' Look . . . Look ! ' the young woman murmured.

She went forward cautiously, looked for and found a straw-bottomed chair. She sat down in the darkness and silence. Their two faces turned toward the pale glimmering, the mysterious sources of radiation, toward radium—their radium.

She was to remember for ever this evening of glow-worms, this magic.

CHAPTER XI

A HARD LIFE

THE existence of Pierre and Marie might have been altogether happy if they had been able to devote their strength to the impassioned struggle with nature in their poor laboratory.

Unfortunately, they had to engage in other struggles, from which they did not always emerge victorious.

For his salary of five hundred francs a month, Pierre gave a course of a hundred and twenty lessons a year at the school of Physics and directed the students'



RADIUM WAS SPONTANEOUSLY LUMINOUS

experiments. This tiring instruction, over which he took great pains, was in addition to his research work. So long as the Curies had no children and Marie could manage the domestic work herself, five hundred francs covered their expenses. But after Irène's birth the cost of a servant and a nurse made heavy inroads into the budget. First Pierre and then Marie went on the warpath: new resources had to be found.

Marie, who wanted to do her share of work, put in her application for a professorship in the Higher Normal School for girls. Meanwhile Pierre also got a better paid post teaching at the P.C.N., an annex of the Sorbonne.

What does it matter to Science if her passionate servants are rich or poor, happy or unhappy, healthy or ill? She knows that they have been created to seek and to discover, and that they will seek and find until their strength dries up at its source.

We cannot, therefore, be surprised at the brilliance of the researches Pierre and Marie carried out successfully during these difficult years. Radioactivity grew and developed, exhausting little by little the pair of physicists who had given it life.

Radioactivity, born in France rapidly conquered in foreign countries.

In 1903 two English scientists, Ramsay and Soddy, demonstrated that radium continually disengaged a small quantity of a gas, helium. This was the first known example of a transformation of atoms. A little later, still in England, Rutherford and Soddy, taking up a hypothesis considered by Marie Curie as early as 1900, published a striking *Theory of Radioactive Transformation*. They affirmed that radio elements, even when they seemed to be unchangeable, were in a state of spontaneous evolution: the more rapid their rate of transformation, the more powerful their 'activity'.

Prodigious radium ! Purified as a chloride, it appeared to be a dull-white powder, which might easily be mistaken for common kitchen salt. But its properties, better and better known, seemed stupefying. Its radiation, by which it had become known to the Curies, passed all expectation in intensity ; it proved to be two million times stronger than that of uranium. Science had already analysed and dissected it, subdividing the rays into three different kinds, which traversed the hardest and most opaque matter—undergoing modification, of course. Only a thick screen of lead proved to be able to stop the insidious rays in their invisible flight.

Radium had its shadow, its ghost : it spontaneously produced a singular gaseous substance, the *emanation* of radium, which was also active, and destroyed itself clearly even when enclosed in a glass tube, according to rigorous law. Its presence was to be proved in the waters of numerous thermal springs.

Another defiance of the theories which seemed the immovable basis of physics was that radium spontaneously gave off heat. In one hour it produced a quantity of heat capable of melting its own weight of ice. If it was protected against external cold it grew warmer, and its temperature would go up as much as 50° F. or more above that of the surrounding atmosphere.

What could it not do ? It made an impression on photographic plates through black paper ; it made the atmosphere a conductor of electricity and thus discharged electroscopes at a distance ; it coloured the glass receivers which had the honour of containing it with mauve and violet ; it corroded and, little by little, reduced to powder the paper or the cottonwool in which it was wrapped.

We have already seen that it was luminous.

Nor was this the end of the wonders of radium : it also gave phosphorescence to a large number of bodies incapable of emitting light by their own means.

And, finally, the radiation of radium was 'contagious'—contagious, like a persistent scent or a disease. It was impossible for an object, a plant, an animal or a person to be left near a tube of radium without immediately acquiring a notable 'activity' which a sensitive apparatus could detect. This contagion, which interfered with the results of precise experiments, was a daily enemy to Pierre and Marie Curie.

Radioactivity, generation of heat, production of helium gas and emanation, spontaneous self-destruction—how far we had travelled from the old theories on inert matter, on the immovable atom! Not more than five years before scientists had believed our universe to be composed of defined substances, elements fixed for ever. Now it was seen that with every second of passing time radium particles were expelling atoms of helium gas from themselves and were hurling them forth with enormous force. The residue of this tiny, terrifying explosion, which Marie was to call the 'cataclysm of atomic transformation', was a gaseous atom of emanation which, itself, was transformed into another radioactive body which was transformed in its turn. Thus the radio elements formed strange and cruel families in which each member was created by the spontaneous transformation of the mother substance: radium was a 'descendant' of uranium, polonium a descendant of radium. These bodies, created at every instant, destroyed themselves according to eternal laws: each radio element lost half its substance in a time which was *always the same*, which was to be called its 'period'. To diminish itself by one half, uranium required several thousand million years, radium sixteen hundred years, the emanation of radium four days, and the 'descendants' of emanation only a few seconds.

Such were the facts which the discovery of radioactivity revealed. Philosophers had only to begin their philosophy all over again and physicists their physics.

The last and most moving miracle was that radium could do something for the happiness of human beings. It was to become their ally against an atrocious disease, cancer.

The German scientists Walkhoff and Giesel⁴¹ announced in 1900 that the new substance had certain physiological effects; Pierre Curie at once applied the technique which seemed to him most practical.

After experimenting on the action of radium on his own arm and on animals it was found that by destroying diseased cells, radium cured growths, tumours and certain forms of cancer. This therapeutic method was to be called Curietherapy. French practitioners made the first treatments of diseased persons with success, employing tubes of emanation of radium lent by Marie and Pierre Curie.

Radium was *useful*—magnificently useful.

The immediate consequence of such revelations can be guessed. The extraction of the new element no longer had merely experimental interest. It had become indispensable, salutary. A radium *industry* was about to be born.

Pierre and Marie watched over the beginning of this industry, which could not have been created without their advice. They prepared with their own hands the first gramme⁴² of radium that saw the light. Little by little the magic properties of radium excited other imaginations, and the couple found practical help in organizing production on a vast scale.

Radium, regularly put on sale, became one of the dearest substances in the world: during these first years, it was estimated at 750,000 gold francs by gramme.

Such an aristocratic material was worth commenting upon: in January 1905, appeared the first number of a review, *Radium*, which was to treat exclusively of radioactive products.

Radium had acquired a commercial personality. It had its market value and its press.

Meanwhile in 1903, Marie presented her thesis on *Recherches sur les Substances Radioactives* and was awarded the title of Doctor of Physical Science.

Some time before the presentation of the thesis, and before the industrial treatment of radium had been developed in France and abroad, Pierre and Marie Curie took a decision to which they did not attach special importance, but which was to have a great influence over the rest of their lives.

By purifying pitch-blende and isolating radium Marie had invented a technique and created a process for its manufacture.

Since the therapeutic effects of radium had become known, radioactive ores were sought for everywhere. Plans for exploitation had been made in several countries, particularly in Belgium and in America. But these factories could only produce the 'fabulous metal' if their engineers knew the secret of the delicate operations involved in preparing pure radium.

Pierre explained these things to his wife one Sunday morning in the little house in the Boulevard Kellermann. The postman had just brought a letter from the United States.

'We must speak a little about our radium,' he said thoughtfully. 'The industry is going to be greatly extended; that is certain now. The recent cures of malignant tumours have been conclusive; in a few years, the whole world will be wanting radium. Just now, in fact, this letter has come—some technicians who want to exploit radium in America ask me to give them information.'

'Well then?' Marie said, taking no vivid interest in the conversation.

'Well, then, we have a choice between two solutions.

We can describe the results of our research without reserve, including the processes of purification . . .

Marie made a mechanical gesture of approval and murmured :

' Yes, naturally.'

' Or else,' Pierre went on, ' we can consider ourselves to be the proprietors, the " inventors " of radium. In this case it would be necessary, before publishing exactly how one worked to treat pitch-blende, to patent the technique and assure ourselves in that way of rights over the manufacture of radium throughout the world.'

Marie reflected a few seconds. Then she said :

' It is impossible. It would be contrary to the scientific spirit.'

Pierre's serious face lightened. To settle his conscience, he dwelt upon it.

' I think so too. . . . But I do not want this decision to be taken lightly. Our life is hard—and it threatens to be hard for ever. We have a daughter; perhaps we may have other children. For them, and for us, this patent would represent a great deal of money, a fortune. It would be comfort made certain, and the suppression of drudgery . . .'

He mentioned, too, with a little laugh, the only thing which it was cruel for him to give up :

' We could have a fine laboratory too.'

Marie's gaze grew fixed. She steadily considered this idea of gain, of material compensation. Almost at once she rejected it.

' Physicists always publish their researches completely. If our discovery has a commercial future, that is an accident by which we must not profit. And radium is going to be of use in treating disease. . . . It seems to me impossible to take advantage of that.'

She made no attempt to convince her husband; she guessed that he had spoken of the patent only out of

scruple. The words she pronounced with complete assurance expressed the feelings of both of them, their infallible conception of the scientist's rôle.

In the silence Pierre repeated, like an echo, Marie's phrase :

'No. It would be contrary to the scientific spirit.'

He was appeased. He added, as if settling a question of no importance :

'I shall write tonight, then, to the American engineers, and give them the information they ask for.' They had chosen for ever between poverty and fortune.

Though Switzerland was the first country to offer the Curies a position worthy of their merit, their first honours came from England. In June 1903, the Royal Institution officially invited Pierre Curie to lecture on radium. The physicist accepted and went to London with his wife for this ceremonial.

In November 1903, a letter announced to Pierre and Marie that the Royal Society of London wished to mark its esteem of them by one of its highest awards : the Davy Medal.

Marie, who was ill, let her husband go to the ceremony without her. Pierre brought back from England a heavy gold medal, on which their names were engraved.

Soon after, in its 'solemn general meeting' of 10 December 1903, the Academy of Science of Stockholm publicly announced that the Nobel Prize in Physics for the current year was awarded half to Henri Becquerel and half to M. and Mme Curie for their discoveries in radioactivity.

Neither of the Curies was present at the session. The French Minister received the diplomas and gold medals in their names from the King's hands. Unwell and over-worked, Pierre and Marie had shrunk from the long journey in midwinter.

To the Curies the money they got was very welcome

but the fame and the constant public attention that they were to receive from now on was always very trying. They had always liked to 'live like wild people', now they had another reason for seeking solitude: they were fleeing from the curious. More than ever they haunted isolated villages, and if they had to pass the night in a country inn they registered there under a false name.

But their best disguise was still their natural appearance. To look at this tall, ungainly man, carelessly dressed, leading his bicycle along some hollow road in Brittany, and the young woman who accompanied him, dressed like a peasant girl, who could imagine them to be the laureates¹³ of the Nobel prize?

Even the most knowing had difficulty in recognizing them. An American journalist, having cleverly followed the trail of the physicists and found them, stopped, perplexed, in front of their fisherman's cottage. His newspaper had sent him to interview Mme Curie, the illustrious scientist. Where could she be? He would have to find out from somebody. . . . From this woman, for instance, who was sitting barefoot on the stone steps at the door, shaking the sand out of her bathing shoes.

The woman lifted her head, fixed her ash-grey eyes on the intruder . . . and all at once she resembled a hundred or a thousand photographs that had appeared in the Press. It was she! The reporter was stunned for a moment, and then dropped down beside Marie and drew out his notebook.

Seeing that flight was impossible, she resigned herself, and answered her interlocutor's questions by short phrases. Yes, Pierre Curie and she discovered radium. Yes, they were continuing their work.

Quickly the reporter put some questions of a less general nature. If he could get some confidences about Marie's

youth, her methods of work, or the psychology of a woman devoted to research. . . .

But at that moment the surprising face was turned from him. In one single sentence which she was to repeat often as a sort of motto, which depicted character, existence and vocation—a sentence which tells more than a whole book—Marie put an end to the conversation :

‘ In science we must be interested in things, not in persons.’

CHAPTER XII

EVERY DAY

THE name of Curie was now a ‘ great name ’. The couple were richer in money, less rich in happy moments.

Marie, especially, had lost her movements of ardour, and joy. She was not as entirely absorbed by scientific thought as Pierre. Her sensibility, her nerves were affected by the events of each day—and they responded badly.

She grew discouraged and accused herself of intellectual impotence, of ‘ stupidity ’. The truth was simpler : in this woman of thirty-six the sheer animal life, worn down for too long, was claiming its rights. Marie needed to cease being ‘ Mme Curie ’ for some time, to forget radium—to eat, sleep and think of nothing.

This could not be. Every day brought new obligations. The year 1904 was to be exhausting—especially exhausting for Marie who was pregnant.

On 6 December 1904, a plump baby was born, crowned with shaggy black hair. Another daughter : Eve.

The smiles and antics of the new-born child, who was cared for by a nurse, enlivened the young woman. Very

small children softened her to tenderness. Relaxed by the forced rest which accompanied childbirth, Marie insensibly regained her taste for life. She approached her laboratory apparatus with a pleasure she had forgotten.

Vacillating for a moment, she had found her steady step again : she had returned to her hard road.

Everything interested her again : the house, the laboratory. She followed the events which shook her native country, with passionate interest : in Russia, the Revolution of 1905 had broken out and the Poles, carried away by the mad hope of deliverance, supported the anti-Tsarist agitation.

The weather was fine, and Marie was in better spirits. The moment had come to fulfil a duty which had been too often postponed : the visit to Stockholm and the Nobel lecture. The couple undertook the splendid journey—that journey which, in our family, was to become a tradition.

On 6 June 1905, in the name of his wife and himself Pierre Curie spoke on radium before the Academy of Science of Stockholm. He evoked the consequences of the discovery of radium. In physics it profoundly modified the fundamental principles of mechanics. In chemistry it stirred up bold hypotheses on the source of energy which supplied the radioactive phenomena. In geology, in meteorology, it was the key to phenomena which had never been explained before. In biology, last of all, the action of radium on cancerous cells had proved efficacious.

Radium had enriched Knowledge and served the Good. But could it also serve Evil ?

One may also imagine (Pierre said in concluding) that in criminal hands radium might become very dangerous, and here we may ask ourselves if humanity has anything to gain by learning the secrets of nature, if it is ripe enough to profit by them, or if this knowledge

is not harmful. The example of Nobel's discoveries is characteristic: powerful explosives have permitted men to perform admirable work. They are also a terrible means of destruction in the hands of the great criminals who lead the peoples towards war.

I am among those who think, with Nobel, that humanity will obtain more good than evil from the new discoveries.

The welcome given them by the Swedish scientists gave the Curies pleasure. They went home delighted.

In the house in the Boulevard Kellermann, protected like a fortress against intruders, Pierre and Marie led the same simple, hidden life. The cares of housekeeping were reduced to the essentials. A charwoman did the heavy work, a maid of all work prepared the meals and brought the dishes to the table.

Even at periods of great overwork Marie reserved time for the care of her children. Her work obliged her to entrust her daughters to servants, but until she had verified on her own account that Irène and Eve had slept and eaten well, that they were washed and combed, had no colds or ills of any sort, she was never at ease.

The couple spent most of their evenings in dressing-gowns and slippers, going through scientific publications or scribbling complicated calculations in their notebooks. Even so, they were to be seen at exhibitions of painting, and seven or eight times a year they permitted themselves two hours at a concert or the theatre.

Pierre and Marie avoided receptions: they were never to be seen in society. But they could not always get out of official dinners or banquets in honour of foreign scientists. It therefore sometimes happened that Pierre would put off the thick woollen suit he wore every day and don his evening clothes, as Marie would put on her one evening dress.

Marie knew nothing of fashions and had no taste. But the discretion and reserve which were the very mark

of her character saved her from being conspicuous and created a sort of style in her dress. When she changed her laboratory clothes for an evening dress, when she wound her ash-blond hair into a crest and timidly hung a light necklace of gold filigree about her neck, she was exquisite. Her slender body and inspired face suddenly unveiled their charm. Beside Marie, with her immense pale forehead and her powerful gaze, other women did not cease to be pretty: but many among them appeared both stupid and vulgar.

Pierre and Marie were vibrating with plans. A new era opened before them: France had taken notice of their existence and was thinking of supporting their efforts.

On 3 July 1905, Pierre Curie entered the Academy, and, though a lukewarm admirer of the illustrious company, he took the liveliest interests in the decisions taken in his favour by the university: his work depended upon them. At the beginning of 1904 the rector had obtained for him the creation of a chair in physics. Here at last was the post, so long desired, of titular professor. Before accepting the promotion Pierre asked where would be the laboratory attached to his work.

A laboratory? What laboratory? There had been no question of a laboratory.

In a second the laureates of the Nobel Prize, parents of radium, discovered that if Pierre left his position in the P.C.N. to teach at the Sorbonne he would run the risk of being able to do no work at all. No space was offered the new professor, and the two rooms he had been using at the P.C.N. would be, as was only natural, assigned to his successor. He was left with the prospect of conducting his experiments in the street.

With his accomplished pen, Pierre wrote his chiefs a polite but firm letter: since the position created for him did not bring with it either a room to work in or an appropriation for research, he had decided to give it up.

He could keep on at the P.C.N.—with its excessive hours of teaching—the little place where he and Marie, somehow or other, could do useful work.

After much discussion the University decided to create a laboratory. But the amount of money that was placed at Pierre Curie's disposal was so small that no laboratory could be built and equipped with it. Eight years more of patience were required before Marie was to install radioactivity in a home worthy of it—a home which Pierre was never to see. The harrowing idea that her companion had waited in vain for his beautiful laboratory—the single ambition of his life—until the very end, was to live within her always.

Of all the Minister's decisions, one alone gave the Curies real pleasure: Pierre was to have three co-workers henceforth, a chief of laboratory assistant, and a laboratory aid. The chief of laboratory work was to be Marie.

Up to now the presence of the young woman in the laboratory had only been tolerated. Marie had accomplished her researches in radium without any rank or salary. In November 1904, a steady, paid position—paid at the rate of two thousand four hundred francs a year!—gave her, for the first time, official rights in her husband's laboratory.

'Madame Curie and I are working to measure radium with precision by the amount of emanation it gives off (Pierre Curie wrote on 14 April 1906). That might seem to be nothing, and yet here we have been at it for several months and are only now beginning to obtain regular results.'

Madame Curie and I are working . . .

These words, written by Pierre five days before his death, express the essence and the beauty of a union which was never to be weakened. Each progress of the work, each of their disappointments and victories, was to link this husband and wife more closely together.

Have I sufficiently pointed out the charm, confidence and familiar good humour of their collaboration of genius? Ideas big and little, questions, remarks and advice were thrown back and forth at every hour of the day between Pierre and Marie. Gay compliments, too, and friendly reproaches. Between these two equals, who admired each other passionately but could never envy, there was a worker's comradeship, light and exquisite, which was perhaps the most delicate expression of their profound love.

And then suddenly on the 19th of April 1906, Pierre Curie died in a tragic road accident. Marie had lost her companion, and the world had lost a great man. This atrocious departure, in the rain and mud, had struck the popular imagination. The newspapers of all countries described in pathetic stories, over several columns, the accident in the Rue Dauphine. Messages of sympathy accumulated in the house in the Boulevard Kellermann with the names of kings, ministers, poets and scientists mixed with obscure names.

On this occasion, as on all others, the woman who was to be known hereafter as an 'illustrious widow' fled from the attacks of fame. To avoid an official ceremony, Marie advanced the date of the funeral to Saturday, 21st April. She refused processions, delegations and speeches, and asked that Pierre be buried as simply as possible in the grave where his mother rested at Sceaux.

The decease of Pierre Curie had brought up some important problems. What was to be the fate of the research work Pierre had left in suspense, and of his teaching at the Sorbonne? What was to become of Marie?

Her relatives discussed these questions in low voices, and listened to the suggestions of the representatives of the Ministry and the university, who succeeded each other at the house in the Boulevard Kellerman. On the morrow

of the obsequies the government officially proposed to award the widow and children of Pierre Curie a national pension. Jacques submitted this plan to Marie, who refused flatly. 'I don't want a pension,' she said. 'I am young enough to earn my living and that of my children.'

In her suddenly strengthened voice could be heard the first faint echo of her habitual bravery.

Between the authorities and the Curie family the exchanges of views wavered somewhat. The university was disposed to keep Marie in its faculty. But with what title, and in what laboratory? Could this woman of genius be put under the orders of a chief? And where was there a professor capable of directing Pierre Curie's laboratory?

Jacques Curie and a friend of Pierre's, called Georges Gouy, informed the dean of the faculty of their conviction: that Marie was the only French physicist capable of pursuing the work she and Pierre had undertaken. Marie was the only teacher worthy of succeeding Pierre. Marie was the only chief of laboratory who could replace him. Traditions and customs must be swept away so as to name Mme Curie professor at the Sorbonne.

On the strong insistence of Marcelin Berthelot, of Paul Appell and Vice-Rector Liard, the public authorities made a frank and generous gesture on this occasion. On 13 May 1906, the council of the Faculty of Science unanimously decided to maintain the chair created for Pierre Curie and to confide it to Marie.

This was the first time that a position in French higher education had been given to a woman.

CHAPTER XIII

ALONE

WE admired Marie when, supported by a man of genius she was able both to manage her home and to take her part in a great scientific task. It did not seem possible to us that she could lead a harder life or put forth a more powerful effort.

Compared to the life that awaited her, this condition was mild. The responsibilities of 'the widowed Mme Curie' would have frightened a robust, happy and courageous man.

She had to bring up two young children, earn their livelihood and her own, and to fill her place as professor with success. Deprived of the masterly collaboration of Pierre Curie, she had to pursue and carry out the researches undertaken with her companion. Her assistants and students had to receive orders and advice from her. One essential mission also remained: to build a laboratory worthy of Pierre's disappointed dreams, where young research workers could develop the new science of radioactivity.

Marie's first care was to give her daughters a comfortable existence. At 6 Rue du Chemin de Fer, at Sceaux, she rented a house without charm, embellished by an agreeable garden.

Mme Curie was content that her daughters should know nothing of the uneasy childhood, drudging adolescence and poverty-stricken youth that had been hers. At the same time she did not wish for them to live in luxury. On several occasions Marie had had the opportunity of assuring a great fortune to Irène and Eve. She did not do so. When she became a widow she had

to decide what to do with the gramme of radium that she and Pierre had prepared with their own hands, which was her private property. Against the advice of Dr Curie and of several members of the family council, she decided, sharing the views of him who was no more, to make to her laboratory a gift of this precious particle, which was worth more than a million gold francs.

In her mind, if it was inconvenient to be poor, it was superfluous and shocking to be very rich. The necessity for her daughters to earn their living later on seemed healthy and natural to her.

When Irène had won her study certificate and reached the age for going to school, Marie anxiously sought for a means of instructing her daughter above and beyond routine.

This whole-souled worker was haunted by the idea of the overwork to which children were condemned. It seemed to her barbarous to install young beings in ill-ventilated schoolrooms and to steal innumerable sterile 'hours of attendance' from them at the age when they should be running free. She wanted Irène to study very little but very well. How was she to set about it?

She reflected, she consulted her friends—professors at the Sorbonne like herself, and, like herself, heads of families. Under her impetus was born the original idea of collective teaching, in which great minds would share the task of instructing all their children according to new methods.

An era of excitement and intense amusement opened for some ten little monkeys, boys and girls, who, dispensing with school, went every day to hear one single lesson given by a chosen master.

On Thursday afternoons they attended a course in physics conducted by Marie Curie. Thanks to her, the abstract and boring phenomena of the manuals were most picturesquely illustrated: bicycle ball-bearings,

dipped in ink, were left on an inclined plane where, describing a parabola, they verified the law of falling bodies. A clock inscribed its regular oscillations on smoked paper. A thermometer, constructed and graduated by the pupils, consented to operate in agreement with the official thermometers, and the children were immensely proud of it.

Marie transmitted her love of science and her taste for work to them. She also taught them the methods which a long career had developed in her.

The laureate of the Nobel Prize sometimes gave these ambitious infants simple lessons in good sense.

'What would you do to keep the liquid contained in this jug hot?' she asked one day.

Some of the children proposed ingenious solutions: to wrap the jug in wool, to isolate it by refined—and impracticable—processes.

Marie smiled and said:

'Well, if I were doing it, I should start by putting the lid on.'

On these homely words ended the lesson for that Thursday.

CHAPTER XIV

SUCSESSES AND ORDEALS

EVERY morning a woman who was very thin, very pale, whose face was getting a little worn and whose fair hair was suddenly turning grey, entered the narrow rooms of the School of Physics, took a coarse linen smock down from its peg to cover her black dress, and set to work.

Professor, research worker and laboratory director, Mme Curie worked with the same incomparable intensity. At the Sorbonne—where she had been promoted to the

titular professorship in 1908—she was giving the first, and for the moment the only, course on radioactivity in the world. Great efforts! Although secondary education in France seemed to her defective, she regarded French higher education with lively admiration. She wanted to make herself the equal of the masters who once had dazzled a young Pole.

After two years of professorship, Marie undertook to write down her lessons. She published in 1910 a masterly *Treatise on Radioactivity*. Nine hundred and seventy-one pages of text barely sufficed to sum up the knowledge acquired in this realm since the day, not so long ago, when the Curies had announced the discovery of radium.

The number of Mme Curie's students grew larger every day. The American philanthropist, Andrew Carnegie, had bestowed on her in 1907 a series of annual scholarships which permitted her to welcome some novices to the school.

Mme Curie had a programme of new researches. She performed them in spite of the steady deterioration in her health.

She purified a few decigrammes of chloride of radium and made a second determination of the atomic weight of the substance. She then undertook the isolation of radium metal. Up to now, every time she had prepared 'pure radium', it had been *salts* of radium (chlorides or bromides) which constituted its only stable form. Marie collaborated with André Debierne in bringing the metal itself to light, undamaged by alterations due to atmospheric agents. The operation—one of the most difficult known to science—was never to be repeated.

André Debierne also helped Mme Curie to study polonium and the rays it emitted. Finally, Marie, in independent work, discovered a method of measuring radium by the measurement of the rays it gave out.

The universal development of Curietherapy made it

necessary to separate tiny particles of the precious matter with rigorous precision. When the thousandth part of a milligramme⁴⁴ is in question, balances are not of much use. Marie had the idea of 'weighing' radioactive substances by the rays that they emitted. She brought this difficult technique to the point of practicability and created a 'service of measures' in her laboratory where scientists, doctors and even ordinary citizens might have active ores or products examined and receive a certificate indicating their radium content.

At the time when she was publishing a *Classification of the Radioelements* and a *Table of Radioactive Constants*, she was performing another work of general importance: the preparation of the first international standard of radium. This light glass tube contained twenty-one milligrammes of chloride of pure radium. It was to serve as a model for the standards afterwards dispersed through the five continents.

After the fame of the Curie couple, the personal fame of Mme Curie mounted and spread like a rocket. Diplomas of doctor *honoris causa*⁴⁵ or of corresponding member of foreign academies arrived by the dozen to encumber the desks at the house in Sceaux, though the laureate never dreamed of making a show of them or even of drawing up a list of them.

In December the Swedish Academy of Sciences, wishing to recognize the brilliant work accomplished by the woman scientist since her husband's death, awarded her the Nobel Prize in Chemistry for the year 1911. No other laureate, man or woman, had been, or was to be, judged worthy of receiving such an award twice.

Weakened and ill, Marie asked Bronya to make the journey to Sweden with her. She also took her elder daughter, Irène with her. The child was present at the solemn meeting. Twenty-four years later, in the same hall, she was to receive the same prize.

During the summer of 1913 she tried her strength by a walking tour in the Engadine, rucksack on back. Her daughters accompanied her with their governess, and the group of excursionists also included the scientist Albert Einstein and his son. A charming comradeship of genius had existed for several years between Mme Curie and Einstein. They admired each other; their friendship was frank and loyal; and sometimes in French, sometimes in German, they loved to pursue interminable palavers in theoretical physics.

In the vanguard gambolled the young ones, who were enormously amused by this journey. A little behind, the voluble Einstein, inspired, would expound to his colleague the theories which obsessed him, and which Marie, with her exceptional mathematical culture, was one of the rare persons in Europe to understand.

Irène and Eve sometimes caught words which seemed to them rather singular. Einstein, preoccupied, passed alongside the crevasses and toiled up the steep rocks without noticing them. Stopping suddenly, and seizing Marie's arm, he would exclaim: 'You understand, what I need to know is exactly what happens to the passengers in a lift when it falls into space.'

Such a touching preoccupation made the younger generation roar with laughter, far from suspecting that the imaginary fall in a lift posed problems of transcendent 'relativity'.

In France, the scientist was at the zenith of her fame. For the past two years the architect Nénot⁴⁶ had been building the Institute of Radium for her on the ground allotted in the Rue Pierre Curie, named after her husband.

The University and the Pasteur Institute had founded the Institute of Radium, which was to comprise two parts: a laboratory of radioactivity, placed under the direction of Marie Curie; and a laboratory for biological research and Curietherapy, in which studies on the treatment of

cancer and the care of the sick would be organized by an eminent physician, Professor Claude Regaud. These twin institutions, materially independent, were to work in co-operation for the development of the science of radium.

This victory came to its heroine when she was no longer either young or strong, and when she had lost her happiness. What did it matter, since she was surrounded by fresh forces, since enthusiastic scientists were at hand to aid her in the struggle? No, it was not too late.

The glaziers were singing and whistling on every floor of the little white building. Above the entrance could already be read these words cut into the stone: INSTITUT DU RADIUM,⁴⁷ PAVILLON CURIE.

* Before these sturdy walls and this exalting inscription Marie evoked the words of Pasteur:⁴⁸

‘If conquests useful to humanity touch your heart; if you stand amazed before the surprising effects of electric telegraphy, the daguerreotype, anæsthesia and so many other admirable discoveries; if you are jealous of the part your country can claim in the further flowering of these wonders—take an interest, I urge upon you, in those holy dwellings to which the expressive name of laboratories is given. Ask that they be multiplied and adorned. They are the temples of the future, of wealth and well-being. It is there that humanity grows bigger, strengthens and betters itself. It learns there to read in the works of nature, works of progress and universal harmony, whereas its own works are too often those of barbarity, fanaticism and destruction.’

In the wonderful month of July the ‘temple of the future’ in the Rue Pierre Curie was at last finished. It was ready now for its radium, its workers and its director.

Only—this July was the July of 1914.

When the war put a stop to her work in the laboratory, Mme Curie volunteered to serve in the medical service. She found that the hospitals, both at the front and behind the lines, were unprovided with X-ray equipment. With characteristic energy she had the hospitals equipped, but the problem still remained of how to help the wounded who were brought to ambulances where there was no electric equipment.

Mme Curie found the solution. She created with funds from the Union of Women of France, the first 'radiological car'; it was an ordinary motor-car in which she put an X-ray apparatus and a dynamo which, driven by the motor of the car, furnished the necessary current. This complete mobile station circulated from hospital to hospital from August 1914 onward.

The rapid advance of the Germans gave Marie a difficult problem to decide. Should she stay in Paris or go to join her daughters in Brittany? And if the enemy threatened to occupy the capital, should she follow the retreat of the medical organizations?

She calmly considered these alternatives and took her decision: she would remain in Paris, whatever happened. It was not only the benevolent task she had undertaken that kept her; she was thinking of her laboratory, of her delicate instruments. 'If I am there,' she thought, 'perhaps the Germans will not dare plunder them; but if I go away, everything will disappear.'

Thus she reasoned, not without some hypocrisy, and discovered logical excuses for the instinct by which she was guided. This obstinate, tenacious, proud Marie did not like the act of flight. To be afraid was to serve the adversary. Nothing in the world would induce her to give a triumphant enemy the satisfaction of occupying a deserted Curie laboratory.

Radiological cars, radiological stations, emanation

service . . . There was still more to come. The lack of trained manipulators worried Marie. She proposed to found and conduct a course of instruction in radiology. Before long about twenty nurses gathered at the Radium Institute for the first course. The programme included theoretical lessons on electricity and X-rays, practical exercises, and anatomy.

When the war ended, Marie, with a confidence and hope which were to grow weaker and weaker, followed from afar the labours of those who were organizing the peace.

She had looked forward with fervour to the moment when the buildings in the Rue Pierre Curie would hum with activity. Her first care was not to spoil the exceptional work accomplished during the war: the service of emanations, the distribution of 'active' little tubes to the hospitals, continued under the direction of Dr Regaud, who had taken possession of the biological building again on demobilization. In the physical section, Mme Curie and her fellow-workers applied themselves to the experiments interrupted in 1914 and began some new ones.

CHAPTER XV

AMERICA

ONE morning in May 1920, a lady was ushered into the tiny waiting-room of the Institute of Radium. She was called Mrs William Brown Meloney, and she edited a great magazine in New York. Trembling, she asked the servant who opened the door if Mme Curie had not forgotten the appointment with her.

She had been waiting for this appointment for years. Mrs Meloney was one of those beings, more and more numerous, whose imaginations were exalted by the life and work of Marie Curie. The scientist represented the highest vision of womanhood to her. And, as this American idealist was at the same time a great reporter, she made determined efforts to draw near to her idol.

After several unanswered requests for an interview, Mrs Meloney had sent Marie, through a scientist they both knew, a final letter of appeal containing the following words :

‘ My father, who was a medical man, used to say that it was impossible to exaggerate the unimportance of people. But you have been important to me for twenty years, and I want to see you for a few minutes.’

The next morning Marie received her at the laboratory. Mrs Meloney afterwards wrote :

‘ The door opened and I saw a pale, timid little woman in a black cotton dress, with the saddest face I had ever looked upon. Her kind patient, beautiful face had the detached expression of a scholar. Suddenly I felt like an intruder.

‘ My timidity exceeded her own. I had been a trained interrogator for twenty years, but I could not ask a single question of this gentle woman in a black cotton dress. I tried to explain that American women were interested in her great work, and found myself apologising for intruding upon her precious time. To put me at my ease Mme Curie began to talk about America.

“ America,” she said, “ has about fifty grammes of radium. Four of them are in Baltimore, six in Denver, seven in New York.” She went on, naming the location of every grain.

“ And in France ? ” I asked.

“ My laboratory has hardly more than a gramme.”

“ You have only a gramme ? ”

“ “ I ? Oh, I have none. It belongs to my laboratory.”

“ I suggested royalties on her patents. The revenue from such patents should have made her a very rich woman. Quietly, she said :

“ “ Radium was not meant to enrich anyone. Radium is an element. It belongs to all people.”

“ “ If you had the whole world to choose from,” I asked impulsively, “ what would you take ? ”

“ And Mme Curie replied gently : “ I need a gramme of radium to continue my researches, but I cannot buy it : radium is too dear for me.” ’

Mrs Meloney conceived of a magnificent plan : she wanted her compatriots to offer a gramme of radium to Marie Curie.

Nothing is impossible in the United States. Mrs Meloney formed a committee which launched a national campaign for the Marie Curie Radium Fund in all the cities of the New World, and less than a year after her visit to the ‘ woman in the black cotton dress ’, Mrs Meloney wrote to Mme Curie : ‘ The money has been found, the radium is yours.’

The generous American women offered Marie Curie inestimable help ; but in exchange they asked her gently, amicably : ‘ Why should you not come to see us ? We want to know you.’

Marie hesitated. She had always fled from the crowd. The trials and display of a visit to America, to the one country in the world which most thirsted after publicity, terrified her.

Mrs Meloney insisted and swept her objections away one by one.

‘ You say you don’t want to leave your daughters ? We invite your daughters too. Ceremonies tire you ? We shall draw up the most reasonable and limited programme of receptions. Come ! We shall make it a fine journey for you, and the gramme of radium will be

solemnly presented to you at the White House by the President of the United States in person.'

Mme Curie was touched. To collect her gramme of radium and to thank America for it she conquered her fears and accepted for the first time in her life, at the age of fifty-four, the obligations of a great official journey.

Some days later Mme Curie went on board the *Olympic*. Her two daughters travelled with her.

Locked in her cabin to escape those who would not leave her alone, she tried to forget her official mission by calling up the humble, peaceful memory of her ordinary life.

New York, bold and ravishing, appeared through a haze of fine weather. Mrs Meloney, who had crossed with the Curie family, came to warn Marie that the journalists, photographers and cinema operators were waiting for her. An enormous crowd, massed upon the landing pier, was on the watch for the scientist's arrival.

On the boat deck of the *Olympic* Marie was installed in a big armchair. Her hat and handbag were taken away from her. Imperious shouts from the photographers—'Look this way, Mme Curie! Turn your head to the right! Lift your head! Look this way! This way! This way!'—rose above the incessant clicking of the forty photographic and cinematographic machines focused in a threatening semi-circle upon that astonished and tired face.

The American tour was a great triumph. Marie visited universities, radium factories, and laboratories. She also went to the White House to meet the President of the United States. From one end of the North American continent to the other, she was given a tremendous ovation by the American people.

At the end of it all she was very tired—and, to tell the

truth, very content. In her letters she rejoiced at having 'made a very small contribution to the friendship of America for France and Poland'.

The stock of radium which she had come to seek left America on the same ship with her. This symbolic gramme inspires certain reflections upon the career of Marie Curie. In order to buy the tiny particle, it had been necessary to organize a campaign of magnificent begging across a whole continent. Marie had to appear in person in the philanthropic cities and offer her thanks.

How can one not be obsessed by the idea that a simple signature given on a patent years ago would have been altogether more effective? How can one avoid thinking that a rich Marie Curie could have given laboratories and hospitals to her country? Had twenty years of struggle and difficulties given Marie any regret?

In some short autobiographical notes drawn up after her return from America Mme Curie asked herself these questions. She answered them:

'A large number of my friends affirm, not without valid reasons, that if Pierre Curie and I had guaranteed our rights, we should have acquired the financial means necessary to the creation of a satisfactory radium institute, without encountering the obstacles which were a handicap to both of us, and which are still a handicap for me. Nevertheless, I am still convinced that we were right.

'Humanity certainly needs practical men, who get the most out of their work, and, without forgetting the general good, safeguard their own interests. But humanity also needs dreamers, for whom the disinterested development of an enterprise is so captivating that it becomes impossible for them to devote any care to their own material profit.

'Without the slightest doubt, these dreamers do not deserve wealth, because they do not desire it. Even so, a well-organized society should assure to such workers

the efficient means of accomplishing their task, in a life freed from material care and freely consecrated to research.'

CHAPTER XVI

FULL BLOOM

I BELIEVE the journey to America had taught my mother something.

It showed her that she was no longer just a student and research worker. She was responsible for a new science and her presence brought success to projects which interested her. From now on she was to reserve a place in her life for these exchanges and these missions.

I shall not describe all Marie's journeys: they were much alike. Scientific congresses, lectures, university ceremonies and visits to laboratories called Mme Curie to a large number of capitals. She was acclaimed in them all. She tried to make herself useful. Too often she was obliged to struggle against the weaknesses of her uncertain health.

There was not a corner of the world where her name was not known. In an old provincial capital of China in the temple of Confucius at Taiyuan-fu, there was a portrait of Madame Curie, placed there among the 'benefactors of humanity' by the wise men of the country, along with Descartes, Newton, the Buddhas and the great emperors of China.

Meanwhile, the Curie Foundation was created in 1920 as an independent institution to collect gifts and subsidies and to support the scientific and medical work of the Radium Institute.

In 1923 the Curie Foundation decided to celebrate the twenty-fifth anniversary of the discovery of radium. The

government associated itself with this intention and passed through parliament, by unanimous vote, a law granting Mme Curie an annual pension of forty thousand francs as a 'national recompense', with the right of inheritance to Irène and Eve.

We have seen Marie Curie in the evening of her life at the mercy of the admiration of crowds, received by presidents, ambassadors and kings all over the world.

One picture, always the same, dominates the memory of these fêtes and processions for me: the bloodless, expressionless, almost indifferent face of my mother.

'In science', she had said long ago, 'we must be interested in things, not in persons.' The years had taught her that the public, and even the governments, did not know how to be interested in things except through persons. Whether she wished to do so or not, she had to use her prestige to honour and enrich science, and she allowed herself to be the agent of propaganda for a cause which was dear to her.

But nothing in her had changed: neither the physical fear of crowds nor the timidity which froze her hands and dried her throat, nor, above all, her incurable inaptitude for vanity.

How could exuberant tributes to a discovery made a quarter of a century ago satisfy the passionate student who survived inside this ageing woman? Discouraged words expressed her revolt against the premature burial which is called celebrity. 'When *they* talk to me about my "splendid work" it seems to me that I'm already dead—that I'm looking at myself dead,' she murmured sometimes and added: 'It seems to me that the services I might still render don't mean much to *them*—and my disappearance would put them more at their ease in paying me compliments.'

Her dissatisfaction and her refusal contained, I believe, the secret of the exceptional power Mme Curie exercised

over crowds. Persons even more amiable, attractive, and celebrated than Mme Curie have often been honoured by the world ; but none of them, perhaps, has shown a face so locked and shuttered, an air of absence so complete. In the storm of acclamations, none of them can have seemed quite so solitary.

In the morning, before eight o'clock, the noisy activity of an untrained servant and the light, hurried step of Mme Curie awoke the household. At a quarter to nine her little closed car stopped on the quay in front of the house and three honks of the horn resounded. Marie flung on her hat and coat and hastened downstairs. The laboratory was waiting for her.

The government's national pension and an annuity provided by American generosity had dissipated material cares. Mme Curie's income, which might have been considered absurdly small by many people, sufficed to assure her comfort, although she profited little by it. She never learned how to be waited upon by a maid. She could never make her chauffeur wait more than a few minutes without feeling vaguely guilty. And if she went into a shop she never looked at the prices, but with infallible instinct she would point out, with her nervous hands, the simplest dress and the cheapest hat : these were the ones that pleased her.

She enjoyed spending money only for plants and stones and country houses. She built two such houses : one in Brittany and the other in the south. As age came on, she went to the Mediterranean for a more ardent sun and warmer sea than she could find in Brittany.

' Aren't you going to the laboratory, Mé ? '

The ash-grey eyes, which for some years now had been sheltered behind shell-rimmed spectacles, turned their gentle, defenceless gaze upon Eve.

' Yes, I'm going there after a bit. But first I've got the

Academy of Medicine. And since the meeting is not until three o'clock I think I shall have time to. . . . Yes, I can stop by the flower market, and perhaps have a minute or two in the Luxembourg Gardens.'

The horn of the Ford had already sounded three times in front of the house. In a few minutes Marie, wandering among the pots of flowers and baskets of slips, would be picking out the plants she wanted for the laboratory garden and depositing them with caution, well protected by newspapers, on the seat in her car.

The gardeners and flower-growers knew her well—but she practically never went inside a florist's shop. Some undefined instinct and the habits of poverty kept her away from precious flowers. Jean Perrin, the gayest and most attentive of her friends, made his irruptions into Mme Curie's house with his arms laden with bouquets. And as if she were admiring jewels, Marie would contemplate the big carnations and fine roses with surprise and with a little timidity.

Half-past-two. The Ford dropped Marie at the gate of the Luxembourg Gardens, and the scientist hastened toward her appointment 'near the lion on the left'. Among the hundreds of children who were playing in the garden on this early afternoon there was one little girl who, when she saw her, would race toward her with all the speed of tiny legs: Hélène Joliot, Irène's child. In appearance Mme Curie was a reserved and undemonstrative grandmother, but she wasted a great deal of time and made long detours in order to spend a few minutes with this baby, dressed in bright red, who questioned her tyrannically: 'Where are you going, Mé? Why don't you stay here with me, Mé?'

The clock on the senate building marked ten minutes to three. Marie must leave Hélène and her sand pies. At the austere meeting hall in the Rue Bonaparte, Marie took her usual place and, the only woman among sixty

venerable colleagues, she participated in the work of the Academy of Medicine.

'Ah! How tired I am!'

Nearly every evening Marie Curie, her face quite pale, worn and aged by fatigue, would murmur this phrase. She left the laboratory very late—at half-past-seven or sometimes at eight o'clock. Her car brought her home, and the three storeys seemed harder to climb than ever before. She put on her slippers, threw a jacket of black wool over her shoulders and wandered aimlessly through the house, made more silent by the end of the day, as she waited for the maid to announce the meal.

It would have been no use for her daughter to say: 'You work too hard. A woman of sixty-five cannot and ought not to work as you do, twelve or fourteen hours a day.' Eve knew perfectly well that Mme Curie was incapable of working any less, and that working less, becoming reasonable, would mean the dreadful indication of old age. And the only wish that the young girl could formulate was that her mother might find the strength to work fourteen hours a day for a long time to come.

CHAPTER XVII

THE LABORATORY

EVEN though she sometimes complained of it, Marie adored the commotion of energy and curiosity that welcomed her from the beginning of the day. Far from attempting to slip away toward her own work, she would stay there, in coat and hat, standing in the middle of her collaborators. Each of the eager faces that met her glance recalled to her an experiment upon which she had reflected in solitude.

It was she who had chosen the students of the laboratory after a minute examination of their capacities. It was she, almost always, who designated their work. It was to her that pupils in distress would come, with the certainty that Mme Curie would find the experimental error that had put them on the wrong road.

During forty years of scientific labour this white-haired scientist had amassed an immense amount of knowledge. She was the living library of radium ; she had read, in the five languages of which she was master, all the publications connected with the experiments undertaken at the institute. She discovered new developments of known phenomena, invented new techniques. And finally, Marie possessed commonsense. Fine-spun theories, attractive but fantastic suppositions, as exposed by certain of her disciples, encountered a rejection from her clear glance and her metallic reason. To work with this daring but prudent master was security.

Little by little the group assembled on the staircase was scattered. Those to whom Marie had given her day's suggestions made off with their loot. Mme Curie would accompany one of them as far as the ' physics hall ' or the ' chemistry hall ' and continue the conversation in front of an apparatus. At last, set free, she would go into her own laboratory, put on her big black working blouse, and become absorbed in her personal work.

Her solitude was short. Somebody knocked at the door. One of the research workers reappeared, with sheets of manuscript in his hand. Behind him another was waiting. . . . On this Monday, the day of the weekly meeting at the Academy of Sciences, the authors of the communications that were to be presented that afternoon came to submit their reports to Mme Curie.

To read these papers Marie went into a very light, narrow, ordinary room, in which a stranger would have had difficulty in recognizing the study of an illustrious

scientist. An office desk of oak, a file, bookshelves, an old typewriter, and a leather arm-chair like a hundred other leather arm-chairs, conferred upon it a decent anonymity. On the table there were a marble inkstand, piles of brochures, a goblet stuck full of fountain pens and sharpened pencils, an 'art object' offered by a students' association, and—surprise!—a little urn from the excavations at Ischia,⁴⁹ dull brown, ravishing.

The hands which held out the reports to the Academy to Mme Curie often trembled with emotion. Their authors knew that the examination would be severe. The writing was never clear, nor chaste enough, to Marie's way of thinking. She tracked down not only the technical errors; she re-wrote whole sentences and corrected faults in syntax. 'I think it might do now,' she would say to the young scientist, more dead than alive, as she handed him back his work.

But if the pupil's work had satisfied Marie, her smile and her pleased remarks—'Very good! That's perfect!'—compensated the physicist for his trouble.

Someone once said of her: 'Mme Curie is not only a famous physicist: she is the greatest laboratory director I have ever known.' Workers in the Curie laboratory, guided by this sure pilot, explored the unexplored compartments of radioactivity one by one. From 1919 to 1934, *four hundred and eighty-three* scientific communications, of which thirty-four were theses, were published by the physicists and chemists of the Institute of Radium. Among these four hundred and eighty-three studies, Mme Curie had thirty-one publications to her credit. She rejoiced over the victories won by her side and with her aid, by that collective person which she did not even call 'my' laboratory, but, with an inexpressible accent of secret pride, 'The Laboratory'. When she pronounced these two words no other laboratory existed on earth.

Her lucid glance discerned faults as well as qualities, and was inexorably arrested by the defects that would keep such-and-such a research worker from becoming a great scientist. Even more than vanity, she distrusted awkwardness. The material catastrophes that awkward hands brought upon the setting up of an experiment exasperated her. Of an experimenter without gifts she said one day to her intimates: 'If everybody was like him there wouldn't be many daring flights in physics!'

'See if there's anything important.'

Marie, harassed and hurried, pointed out last night's mail to her secretary.

The envelopes frequently bore simplified addresses: 'Mme Curie, Paris', or 'Mme Curie, scientist, France.' A good half of them contained requests for autographs and letters from maniacs.

A printed card answered the autograph-hunters: 'Mme Curie does not wish to give autographs or sign photographs and asks you to excuse her.' To the hysterical writers of many of the other letters, in which inks of different colours alternated over eight or ten pages—misunderstood inventors, persecuted madmen, madmen in love, and threatening madmen—there was only one answer possible: silence.

There remained the other letters. Marie conscientiously dictated to her secretary messages for all her colleagues abroad and answers to the desperate appeals of those who imagined that Mme Curie could cure any disease or alleviate any suffering. There were also the letters to the manufacturers of apparatus, estimates, bills, answers to circulars.

She was harassed by demands for interviews. On Tuesday and Friday mornings Marie put on her best black dress. 'I have to be suitably dressed; it's my day,' she would say, her face darkening and her eyebrows

lowered. In the laboratory vestibule there would be petitioners waiting for her, as well as journalists, who had been frozen beforehand by her secretary's warning: 'Madame Curie will receive you only if you have technical information to ask her for. She does not give personal interviews.'

Even though Marie was courtesy itself, nothing encouraged the interviewer to prolong the conversation, neither the little reception room, bare and uncomfortable, the hard chairs, the impatient flicking of the scientist's fingers, nor Mme Curie's sly glances toward the clock.

On Mondays and Wednesdays Marie was nervous and agitated from the time she got up. At five o'clock on these days she lectured. After lunch she shut herself in her study, prepared the lesson, and wrote the heads of chapters of her lecture on a piece of white paper. Towards half-past four she would go to the laboratory and isolate herself again in a little rest-room. She was tense, anxious, unapproachable. Marie had been teaching for twenty-five years: yet every time she had to appear in the little amphitheatre before the twenty or thirty pupils who rose in unison at her entrance she unquestionably had stage fright.

Tireless and terrible activity! In her 'idle moments' Marie wrote scientific articles and books: a treatise on Isotrophy and the Isotropes, a brief and touching biography of Pierre Curie, a new scientific treatise that would fix in perfect form the lectures of Mme Curie.

These brilliant, fertile years were also the years of a dramatic struggle: Mme Curie was threatened with blindness.

The doctor told her in 1920 that a double cataract was going to bring the night upon her little by little. Marie did not allow her despair to appear. She told her daughters of this misfortune without hesitation, and

immediately talked of the remedy, the operation, which could be attempted in two years, in three years. Till then the lenses of her spectacles grew thicker and thicker.

'Don't speak of them to anybody,' she used to say. Her fixed idea was to keep the news from slipping out by indiscretion, lest a newspaper publish some fine day: 'Mme Curie is an invalid.'

Her relatives and her physicians became her accomplices. Marie had taken a borrowed name: It was 'Mme Carré', an aged, unobtrusive woman, who suffered from a double cataract, and not Mme Curie. It was Mme Carré's glasses that Eve went to get at the oculist.

If Marie, wandering in a fog which her glance could no longer penetrate, had to cross a street or climb a staircase, one of her daughters took her by the arm and signalled dangers and obstacles to her by an imperceptible pressure of the hand. At table it was necessary to pass to her such objects as the salt-cellar which she was seeking by touch on the table-cloth with pathetically assumed confidence.

But how was this heroic yet terrible farce to be kept up in the laboratory? Eve suggested taking her mother's most direct collaborators into confidence so that they could manipulate microscopes and instruments of measurement for her. Marie answered dryly: 'Nobody needs to know that I have ruined eyes.'

For her work, so minute, she invented a 'blind man's technique'. She used giant lenses and put coloured signs, very visible, on the dials of her instruments. She wrote the notes she had to consult during lectures in enormous letters, and even in the bad light in the amphitheatre she succeeded in deciphering them.

She concealed her trouble with an infinity of ruses. If a pupil was obliged to submit to Mme Curie an

experimental photograph showing fine lines, Marie, by hypocritical questioning, first obtained from him the information necessary to reconstruct the aspect of the photograph mentally. Then, and then alone, she would take the glass plate, consider it, and *appear* to observe the lines.

In spite of these precautions, this noble duplicity, the laboratory suspected the drama. And the laboratory was silent, pretending not to know, playing the game as cleverly as Marie.

Those were torrid days at the clinic, where Eve spoon-fed the motionless, blind 'Mme Carré', after her operation. The anxiety of unexpected complications followed: lamorrhages which destroyed all hope of cure for some weeks. Two other operations followed in March 1924, and a fourth operation in 1930. Hardly was Marie released from dressings before she began again to use her eyes, although they were badly damaged and no longer capable of focusing.

Little by little she triumphed over her ill fortune. Helped by thick glasses, she acquired almost normal sight, went out alone, even drove her car, and again succeeded in making delicate measurements in the laboratory. As a last miracle in a miraculous life, Marie emerged again from the shadows, and found light enough to work, to work to the end.

When she was at work the rest of the world was effaced. In 1927, when Irène was seriously ill and Marie was tormented by despair, a friend came to see her in the laboratory to ask for news. He received a laconic answer and an icy look. Hardly had he left the room when Marie, inignant, said to her assistant: 'Why can't people leave one alone to work?'

If an experiment did not give the hoped for result, Marie suddenly seemed thunderstruck by some unknown disaster. Seated on a chair, her arms crossed, her back

humped, her gaze empty, she suggested some old peasant woman, mute and desolate in a great grief. The collaborators who saw her were vaguely afraid some accident had happened, and inquired. Marie lugubriously pronounced the words that summed up everything: 'We haven't been able to precipitate actinium X.' Or else, sometimes she openly accused the enemy, thus: 'That polonium has a grudge against me.'

But success made her light and young, fluttering. She wandered cheerfully in the garden, as if she wanted to tell the rambler roses and the trees and the sun how happy she was. She was reconciled to science, she was ready to laugh and to marvel. When a research worker, profiting by her evident good humour, proposed to show her a current experiment, she followed him eagerly, bent over the apparatus where the numeration of atoms took place, and admired the sudden irradiation of a mineral ore by the action of radium.

Before these familiar miracles a supreme happiness was set alight in her ash-grey eyes. One might have said that Marie was gazing at the most enchanting picture in the world.

'Ah, what a pretty phenomenon!' she would murmur.

CHAPTER XVIII

THE END OF THE MISSION

MADAME CURIE often spoke of her own death. She commented upon the inevitable event with apparent calm and considered its practical consequences. Without emotion she would pronounce phrases like: 'It is evident that I can't live many more years,' or else: 'I am worried about the fate of the Institute of Radium when I am no longer there.'

But there was no serenity, no acceptance, in her. She repulsed with all her instinct the idea of an end. Those who admired her from afar thought she had an incomparable life behind her. In Marie's eyes this life was negligible, without proportion to the work undertaken.

Thirty years before, with a foreboding of his death, Pierre Curie had buried himself in work with tragic ardour. Marie, in turn, took up the obscure challenge. She scorned a fatigue which became more evident every day, and the chronic ills that oppressed her: her bad sight, rheumatism in one shoulder, droning murmurs in her ears.

What did all that amount to? There were other things, more important. Marie had just built a factory for the treatment of ores in mass; she had wanted this factory for a long time and had organized the first tests there with enthusiasm. She was preoccupied by the writing of her book—a monument of science which nobody else could write once Mme Curie had disappeared. And the research work on the actinium family was not advancing rapidly enough. When it was finished she had studies on the 'fine structure' of alpha rays to undertake. Marie rose early, hurried to the laboratory, and returned there at night after dinner. . . .

She was working with singular haste—and also with the singular imprudence which was usual with her. She had always scorned the precautions which she so severely imposed on her pupils: to manipulate tubes of radioactive bodies with pincers, never to touch unguarded tubes, to use leaden 'bucklers' to ward off the harmful radiations. She barely consented to submit to the blood tests which were the rule at the Institute of Radium. Her blood content was abnormal. What of it? . . . For thirty-five years Mme Curie had handled radium and breathed the emanation of radium. During the four years of the war she had been exposed to the even more dangerous radiation of the X-ray apparatus. A slight

deterioration in the blood, annoying and painful burns on the hands, which sometimes dried up and sometimes suppurated, were not, after all, such very severe punishments for the number of risks she had run !

She felt tired and made a point of proving to herself that she was not in poor health. She went skating at Versailles and joined Irène in the ski fields of Savoy ; she was happy to have kept supple and agile limbs. At Easter time, profiting by Bronya's visit to France, she organized a motoring trip in the south with her elder sister.

The expedition was disastrous. She caught a chill and when she returned to Paris the doctor said that she had influenza. Marie took little account of the light fever which was always with her. Bronya, vaguely worried, went back to Poland. Beside the Warsaw train, on the platform they had so often trod, the two sisters embraced for the last time.

Marie was wavering between illness and health. On the days when she was feeling equal to it she went to the laboratory. When she was dizzy and weak, she stayed at home and worked on her book.

But her secret enemy was gaining rapidly on her. The fever became more insistent and the chills more violent.

She went up and down the tiring stairs to and from her flat, working nearly every day at the Radium Institute. On one sunny day in May 1934, she stayed until half-past three in the physical laboratory, wearily touched the tubes and the apparatus—her faithful companions. She exchanged a few words with her collaborators : ' I have a fever ', she murmured, ' and must go home '.

She made a tour of the garden again, where the new flowers were making brilliant splashes of colour. Suddenly she stopped before a sickly rambler rose and called her mechanic :

' Georges, look at this rose-vine · you must see to it right away ! '

A student came up to her and begged her not to remain out-of-doors, but to go home. She yielded, but before getting into her car she turned back again :

‘ Don’t forget, Georges : the rose-vine . . . ’

This worried glance toward a blighted plant was her farewell to the laboratory.

She did not leave her bed again. The unsatisfactory struggle against an uncertain disease, called grippe and bronchitis by turns, condemned her to a fatiguing regime : she endured it with sudden terrifying docility and consented to be carried to a clinic for a thorough examination. Two radiographies and five or six analyses left the specialists who had been called to her bedside still perplexed. No organ seemed to be attacked, no definite disease declared itself. But as the X-ray pictures of the lung were clouded by the old lesions and a little inflammation, Marie was treated accordingly. When she went home neither better nor worse than before, the word ‘ sanatorium ’ was pronounced for the first time.

Eve fearfully suggested the idea of this exile to her. Here again Marie obeyed and consented to the departure. She had hope in purer air, and imagined that the noise and dust of the city kept her from being cured.

She grew weaker. Before attempting to move her to a sanatorium, Eve asked for a last consultation between four eminent men of the faculty—the best and most celebrated doctors in France. In their doubt, they concluded that her old tubercular lesions had awakened. They believed that a visit to the mountains would conquer her fever. They were mistaken.

Preparations were made in tragic haste : Marie’s strength was spared as much as possible and she no longer saw any but intimate friends.

In spite of a sudden turn for the worse, the doctors advised immediate departure. The journey was sheer torture : in the train, arriving at Saint-Gervais^{so} Marie

collapsed, fainting, in the arms of Eve and the nurse. When she was at last installed in the best room at the sanatorium of Sancellemoz,⁵¹ new X-ray photographs and examinations were carried out: the lungs were not attacked and the journey had been useless.

Her temperature was over 104° . This could not be hidden from Marie, who always inspected the thermometer with a scientist's attention. She hardly spoke by then, but her paling eyes reflected a great fear. Professor Roch of Geneva, called in at once, compared the blood tests of the last few days, in which the number of white corpuscles and that of red corpuscles were both falling in a rapid line. He diagnosed pernicious anæmia in its extreme form. He comforted Marie, who was obsessed by the idea of gallstones. He assured her that no operation would be inflicted upon her and undertook her treatment with desperate energy. But life was in full flight from her tired body.

On the morning of 3 July, for the last time Mme Curie could read the thermometer held in her shaking hand and distinguish the fall in temperature which always precedes the end. She smiled with joy. And as Eve assured her that this was the sign of her cure, and that she was going to be well now, she said, looking at the open window, turning hopefully toward the sun and the motionless mountains: 'It wasn't the medicines that made me better. It was the pure air, the altitude.'

During her agony she made dreamy, amazed complaints: 'I can't express myself any more. I'm absent-minded.' She did not pronounce the name of any living person. She did not call on her elder daughter, who had arrived at Sancellemoz the day before with her husband, or Eve or her relations. The great and little worries of her work wandered aimlessly in her marvellous brain and were expressed by inconsequent phrases: 'The paragraphing

of the chapters ought to be done all alike . . . I've been thinking of that publication . . .'

And, staring fixedly at a teacup in which she was trying to stir a spoon—no, not a spoon, but a glass rod or some delicate laboratory instrument :

' Was it done with radium or with mesothorium ? '

She had drawn away from human beings ; she had joined those beloved ' things ' to which she had devoted her life, and joined them for ever.

She spoke only indistinctly after that—except when she made a weak cry of exhaustion to the doctor who came to give her an injection : ' I don't want it. I want to be let alone.'

Her last moments revealed the strength, the remarkable resistance, in a creature whose fragility was only apparent, of her robust heart, trapped in a body from which all heat was departing, which continued to beat tirelessly, implacably. For another sixteen hours Dr Pierre Lowys and Eve each held one of her icy hands. At dawn, when the sun had set the mountains aglow and was beginning its journey across a beautifully pure sky, when the full light of a glorious morning had filled the room, the bed, and reached the hollow cheeks and expressionless eyes of ashen grey made stony in death, the heart, at last, beat no more.

Science still had to pronounce its verdict over this body. The abnormal symptoms, the blood tests, differing from those in any known case of pernicious anæmia, accused the true criminal : radium.

' Mme Curie can be counted among the eventual victims of the radioactive bodies which she and her husband discovered,' Professor Regaud wrote.

The news escaped from the silent sanatorium and was spread round the world, reaching points of acute suffering here and there : in Warsaw, Hela ; in Berlin, in a train that was hurrying toward France, Joseph Sklodovski :

and Bronya—Bronya who was to try in vain to get to Sancellemoz in time to see the beloved face again. In Montpellier, Jacques Curie; in London, Mrs Meloney; in Paris, faithful friends.

The young scientists sobbed before the inert apparatus at the Radium Institute. Georges Fournier, one of Marie's favourite students, wrote: 'We have lost everything.'

Mme Curie was sheltered from these sorrows, agitations and tributes, on her bed at Sancellemoz, in a house where men of science and devotion, her own kind, had protected her to the end. No stranger was admitted to trouble her rest even by a look. No curious eyes were ever to know with what supernatural grace she invested herself in farewell. All in white, her white hair laying bare the immense forehead, the face at peace, as grave and valiant as a knight in armour, she was, at this moment, the noblest and most beautiful thing on earth.

Her rough hands, calloused, hardened, deeply burned by radium, had lost their familiar nervous movement. They were stretched out on the sheet, stiff and fearfully motionless—those hands which had worked so much.

On Friday, 6 July 1934, at noon, without speeches or processions, without a politician or an official present, Mme Curie modestly took her place in the realm of the dead. She was buried in the cemetery at Sceaux in the presence of her relatives, her friends, and the co-workers who loved her. Her coffin was placed above that of Pierre Curie. Bronya and Joseph Sklodovski threw into the open grave a handful of earth brought from Poland. The gravestone was enriched by a new line: MARIE CURIE-SKLODOVSKA, 1867-1934.

A year later, the book which Marie had finished before disappearing brought her last message to the young 'lovers of physics'. At the Radium Institute, where work had been resumed, the enormous volume was added

to other scientific works in the light-filled library. On the grey cover was the name of the author : ' Mme Pierre Curie, Professor at the Sorbonne. Nobel Prize in Physics. Nobel Prize in Chemistry.'

The title was one severe and radiant word :

RADIOACTIVITY.

DIFFICULT WORDS

1	Vladislav Sklodovski ..	Vwa-des-wa Skwad-oskee.
2	Manya	Mun-eea.
3	Zosia	Zo-sheea.
4	Anciupecio	An-tew-pets-eeo
5	Bronislava (Bronya) ..	Bron-eea.
6	Ivanov	Ee-van-of.
7	Gymnasium	High School.
8	Intelligentsia	Educated people who think for themselves.
9	Siberia	The place of exile for Russian prisoners.
10	Skłodowska	Feminine version of Skłodovski.
11	Stanislas Poniatovski	Stanis-wos Ponia-toskee.
12	Mlle Tupalska (Tupsai)	Tup-ul-ska.
13	Mlle Sikorska	Shee-kor-ska.
14	Orthodox	The Russian script, which is different from the Roman script.
15	Vielichestvo	Highness (Russian) Vee-lik-est-vo.
16	Michalovska	Mee-ha-woska.
17	Przyborovska	Pshee-boroska.
18	Gretchen	A German girl. Gretchen is a very common name in Germany.
19	Léonie Kunicka ..	Lay-o-nee Koon-its-ka.
20	Ula	Oo-wa
21	Kulig	A kind of fancy dress ball.
22	Orthodox	The Russian orthodox church.
23	Sorbonne	The most ancient and famous university of France.
24	Latin Quarter	The district of Paris where students and artists live.
25	Szczuki	Sh-ju-kee.
26	100 kilometres ..	About sixty miles.
27	Casimir Dluski ..	Kas-im-ir Dwu-skee.
28	Imperial	The top of a double-decked omnibus drawn by horses.
29	Baccalaureate ..	A school leaving examination which qualifies a student for entrance to a university.
30	Forty Roubles ..	Approximately fifty-four rupees.
31	Kowalski	Ko-wal-skee.
32	Pierre Curie	Pee-air Kew-ree.
33	Jacques	Shak.
34	Sceaux	So.
35	Henri Becquerel ..	Ong-ree Bek-erel.
36	Röntgen	Row-nt-jen.
37	Henri Poincaré ..	Ong-ree Puan-kar-ay.

38	St. Joachimsthal	..	Saint Yo-akims-tarl.
39	Andre Debierne	..	Orndray Deb-ee-airn.
40	A decigramme	..	one and a half grains.
41	Walkhoff and Giesel	..	Vol-kof and Gee-sel (hard G).
42	Gramme	..	15.4 grains.
43	Laureates	..	Prize winners.
44	Milligramme	..	.015 grain.
45	Doctor <i>honoris causa</i>	..	The degree of Doctor conferred as an honour on great men.
46	Nénot	..	Na-no.
47	Institut du Radium	..	Radium Institute.
48	Pasteur	..	Past-err.
49	Ischia	..	An island off the Italian coast.
50	Saint-Gervais	..	Sang Jair-vay.
51	Sancellemoz	..	Sawn-sel-emoz.

QUESTIONS

CHAPTER I

1. Why was the Polish intelligentsia always in revolt against the Russians and what did they do to fight Russian rule?
2. Why did Polish children learn their lessons in Russian?
3. What do you understand by 'the convoy of chained rebels'?

CHAPTER II

1. Explain why the history lesson was interrupted.
2. The questions that Mr Hornberg asked Manya were very simple; why did she burst into tears after he left?
3. Explain:—*orthodox letters; subtlest humiliations; hierarchic details.*

CHAPTER III

1. Why did Manya and Kazia dance with joy at the news of the assassination of Tsar Alexander II?
2. What sort of plot was it in which Leonie Kunicka's brother was involved?
3. Explain:—*in spite of the tribute it had just paid to unhappiness; slave morality.*

CHAPTER IV

1. What made Manya decide to become a governess?
2. Describe any efforts you have made to teach poor children to read and write and compare them with Manya's experiences in Szczuki.

3. Why did Bronya and Manya want to study at the Sorbonne?
4. Explain:—*young lady without a dowry; vain chimeras—sterile regrets and disordered impulses toward independence; defrauded creatures.*

CHAPTER V

1. Why did it appear miraculous to Manya that in Paris people spoke French?
2. Explain:—*tragic immobility of the young girl's existence; sacrificial demon; she had chosen between the pettiness of equal days and an immense life.*

CHAPTER VI

1. Suppose you had to live on Rs.54 a month, how would you arrange your budget?
2. Compare Marie Curie's student days with those of any other great man or woman.
3. Explain:—*spartan existence; the money which now could serve as lifebuoy to another poor young girl.*

CHAPTER VII

1. What were the things Pierre Curie admired in Marie?
2. What was unique about Marie Curie's wedding?
3. Why did Marie hesitate to marry Pierre?

CHAPTER VIII

1. Why were visitors not welcome at the Curies?
2. What do you think should be done to prevent great scientists like the Curies from wasting their energy and time on domestic worries?
3. Explain:—*conjugal life; Madame Curie had a tryst with fame.*

CHAPTER IX

1. What decided Marie's choice of subject for research?
2. Describe in your own words the various steps by which polonium and radium were discovered.
3. Explain:—*unplumbed; incognito; 'pessimistic' calculations.*

CHAPTER X

1. Describe in your own words how the Curies convinced the physicists and chemists of the existence of radium.
2. What do you understand by a radioactive body?
3. Explain:—*residue; war of attrition; spontaneously luminous.*

CHAPTER XI

1. Why did the Curies decide not to patent the technique of preparing radium ?
2. Who are the Indian scientists who have been awarded the Nobel Prize ?
3. What is the significance of ' In science we must be interested in things, not in persons ' ?
4. What do you understand by :—*radium was ' contagious ' ; Curie-therapy ; invented a technique.*

CHAPTER XII

1. Do you agree with Pierre Curie that humanity will obtain more good than evil from scientific discoveries ?
2. The Curies were poor and their lives were spent in work ; why do you think they were happy in this ?
3. Explain :—*lukewarm admirer, obsequies ; unanimously decided.*

CHAPTER XIII

1. In what way do you think the pupils benefited by the educational experiment conducted by Marie Curie and her friends ?
2. Do you think it is healthy and natural that women should earn their own living ?

CHAPTER XIV

1. Put in your own words and elaborate Louis Pasteur's moving appeal for more and better laboratories.
2. Why did Marie's hope in the work of those who were organizing the peace grow weaker and weaker ?
3. Diplomas of doctor *honoris causa* are awarded to all great scientists. Do you think they should be awarded to great politicians and great soldiers ?
4. Explain :—*novices, international standard of radium, glaziers.*

CHAPTER XV

1. Why did Marie Curie go to America ?
2. Do you agree with Marie Curie that she and Pierre were right in not guaranteeing their rights in the preparation of radium ?
3. Explain :—*campaign of magnificent begging.*

CHAPTER XVI

1. Why do you think Madame Curie deserves to be given a place among the benefactors of humanity?
2. Great people can be divided into those who enjoy their fame and those who are indifferent to it. Give the names of some of our great men in either class.
3. Explain :—*premature burial which is called celebrity; detours.*

CHAPTER XVII

1. Describe in your own words Marie's arrival every morning at her laboratory.
2. Write an imaginary interview between Madame Curie and a journalist trying to collect material for a gossip column.
3. Explain :—*metallic reason, decent anonymity, stage fright.*

CHAPTER XVIII

1. If you had to choose one of the following adjectives to describe Madame Curie's life which would you choose and why?—*useful, difficult, triumphant, inspiring, tragic, noble, happy.*



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